104

ALTERNATIVE FUTURES FOR THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES "THE GALVIN REPORT" AND NATIONAL LABORATORIES NEED CLEARER MISSIONS AND BETTER MANAGEMENT, A GAO REPORT TO THE SECRETARY OF ENERGY

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Alternative Futures for the Departm...

HEARING

BEFORE THE

SUBCOMMITTEE ON BASIC RESEARCH

AND

SUBCOMMITTEE ON
ENERGY AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTH CONGRESS

FIRST SESSION

MARCH 9, 1995

[No. 11]

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CONTENTS

WITNESSES

Page

March 9, 1995:

Robert Galvin, Task Force on Alternative Futures for the Department of Energy National Laboratories; Chairman of the Executive Committee of Motorola, Inc 12
Hon. Hazel O'Leary, Secretary, DOE, Washington, DC 21
Dr. Siegfried Hecker, Director, Los Alamos National Laboratories 99
Dr. Albert Narath, President, Sandia National Laboratories 108
Dr. Bruce Tarter, Director, Lawrence Livermore National Laboratory 129
Dr. John Denson, Director, Idaho National Engineering Laboratory 145
Dr. Charles Gay, Director, National Renewable Energy Laboratory 152
Dr. William Madia, Director, Pacific Northwest Laboratory 161
Dr. Nicholas Samios, Director, Brookhaven National Laboratory 170
Dr. Alan Schriesheim, Director, Argonne National Laboratory 182
Dr. Charles V. Shank, Director, Lawrence Berkeley Laboratory 188
Dr. Alvin Trivelpiece, Director, Oak Ridge National Laboratory 192

APPENDIX I

Attendance Record 212
Charter 214
Additional testimony submitted for the record:
Dr. John Peoples, Director, Fermi National Accelerator Laboratory 217
Victor Rezendes, GAO, Director, Energy and Science Issues, Resources, Community, and Economic Development Division 224
Dr. Burton Richter, Director, Stanford Linear Accelerator Center 235

APPENDIX II

Responses to written questions submitted to Secretary O'Leary by:
Representative Sheila Jackson-Lee 239
Representatives Geren and Brown 256
Representative Zach Wamp 258
Chairman Dana Rohrabacher 263
Responses to written questions submitted to Robert Galvin by:
Chairman Dana Rohrabacher 306
Representatives Brown and Geren 818
Representative Bill Baker 819
Followup questions submitted to Robert Galvin by Mr. Rohrabacher 822
Responses to written questions submitted to Dr. Siegfried Hecker by Chairman Dana Rohrabacher 847
Responses to written questions submitted to Dr. Albert Narath by Chairman Dana Rohrabacher 857
Responses to written questions submitted to Dr. C. Bruce Tarter by:
Chairman Dana Rohrabacher 865
Representative Bill Baker 875
Responses to written questions submitted to Dr. Charles Gay by Dana Rohrabacher 900
Responses to written questions submitted to Dr. John Denson by Dana Rohrabacher 944
Responses to written questions submitted to Dr. William Madia by Dana Rohrabacher 950
Responses to written questions submitted to Dr. Nicholas Samios by Dana Rohrabacher 961

Page

Appendix II—continued:

Responses to written questions submitted to Dr. Alan Schriesheim by Dana Rohrabacher 974
Responses to written questions submitted to Dr. Charles Shank by Dana Rohrabacher 979
Responses to written questions submitted to Dr. Alvin Trivelpiece by:
  Chairman Dana Rohrabacher 984
  Representative Zach Wamp 990
Responses to written questions submitted to Dr. John Peoples by Dana Rohrabacher 994
Responses to written questions submitted to Dr. Burton Richter by Dana Rohrabacher 999

APPENDIX III

Summary of Recommendations from the Task Force by Robert Galvin 1002
Alternative Futures for the Department of Energy by the Secretary of Energy Advisory Board, Volumes I & II 1011
Department of Energy National Laboratories Need Clearer Missions and Better Management, a United States General Accounting Office Report to the Secretary of Energy 1194

ALTERNATIVE FUTURES FOR THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES "THE GALVIN REPORT" AND NATIONAL LABORATORIES NEED CLEARER MISSIONS AND BETTER MANAGEMENT, A GAO REPORT TO THE SECRETARY OF ENERGY

THURSDAY, MARCH 9, 1995

U.S. HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE, SUBCOMMITTEE ON BASIC RESEARCH, AND SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
Washington, D. C.

The Subcommittees met, pursuant to call, at 9:35 a.m. in Room 2318 of the Rayburn House Office Building, the Honorable Steven H. Schiff, Chairman of the Subcommittee on Basic Research, presiding.

Mr. SCHIFF. I'd like to call the Subcommittee to order. We have a number of witnesses who have busy schedules, and I'd like to begin the proceedings.

I would like to begin by welcoming everyone here today, and I'd also like to make note that our first panel, consisting of Secretary of Energy Hazel O'Leary and Mr. Galvin, have both asked to be dismissed around 11:00 o'clock because of other matters in their schedule. I would like to accommodate that.

For that reason, I would like to do a number of things to move this hearing along. Also, of course, because we have other distinguished panel members that follow, but in that regard first, I'm going to limit opening statements to the two Chairs of the two Subcommittees holding this hearing, and the two ranking members.

Also, I see that we have Mr. Brown, the ranking Democratic member of the Full Committee, and we may have Mr. Walker. Naturally, we will include them to give oral opening statements.

I want to say however, that all members of both Subcommittees are most welcome to submit written opening statements for the record.

Second, I want to say that, for the purpose of questioning, I'm going to propose observing the five-minute rule for members very rigorously here.

If we have the time for a second round of questioning, I think that would be very appropriate, and we can do so, but I want to do my best to make sure that every member attending this hearing has the opportunity to ask questions.

If it goes the other way, if questioning goes to where not every member has had a chance to ask questions by 11:00 a.m., or members really would like a second round of questions, but don't have that opportunity, then I invite all members of the Subcommittees to submit written questions to me and I will submit them to our witnesses.

Let me say further, to abbreviate things, that I have a written opening statement prepared. Without objection, I would ask that my written opening statement be made part of this record. Again, without objection, all members' written opening statements.

[The prepared statements of Mr. Schiff, Mr. Geren, Mr. Rohrabacher, and Mrs. Morella follow:]

Statement of the Honorable Steve Schiff
Chairman, Subcommittee on Basic Research
Galvin and GAO Reports on the Future of the DOE National Labs
March 9, 1995

Good Morning. I would like to welcome all of our guests; Secretary O'Leary, Bob Galvin, and our distinguished group of National Laboratory directors--here today to testify before this joint subcommittee hearing.

I would like to thank Chairman Rohrabacher of the Subcommittee on Energy and Environment for agreeing to hold this joint hearing with my Subcommittee on Basic Research. Chairman Rohrabacher and I have agreed to address the question of the future of the National Laboratories jointly and cooperatively, because we both believe this will be the best way to accomplish our shared goal of improving the DOE laboratory system.

Congress has, for a number of years, been discussing the need for improving the management and operation of the generally well run DOE laboratories. Today we begin this Committee's process of looking very closely at the entire National Laboratory structure in light of the Galvin

Report and the changes in our Congress which occurred last November, particularly the call to us to downsize government.

I, for one, believe in the great scientific and national security value that the DOE laboratory system provides to this Nation. I also know that every system can be improved. That is why I am particularly grateful to Bob Galvin and his Task Force, which has provided us with such a thorough report on the Future of the National Labs. There is much in this report with which I thoroughly agree--particularly their conclusion that the current system of governance imposed upon the laboratories by the Congress and the DOE needs improvement. Other items in the report I believe need more description and discussion, such as the proposal to corporatize the labs. Yet the value of using this Task Force Report as a starting point and baseline for generating and measuring changes in the future direction of DOE's National labs is something I strongly endorse.

Secretary O'Leary, who I commend for requesting the Task Force Report, will also provide us with comments -- for which we thank her. It appears that the Department is already beginning to take steps to implement some of the Report's recommendations. I am anxious to hear about how that will be accomplished. I am also anxious to hear whether the National Laboratory Directors feel that such changes will actually result in better governance of the Labs at their end of the pipeline, where the work is actually done. I wish to express my willingness to work with the Secretary in implementing the Report's recommendations.

I would also like to mention another report, provided to the Secretary of Energy by the General Accounting Office on the need for clearer missions and better management for the labs. The conclusions drawn by the GAO parallel those of the Galvin Report, and we welcome testimony from our witnesses on this report as well today.

Before closing, let me say that it is my intent to introduce legislation which will define the missions of the National Laboratories to assure they remain world-class scientific centers. Depending on the testimony at this and other hearings, my legislation may also deal with governance and technology transfer issues as well.

I look forward to working with Chairman Rohrabacher and my colleagues as we address these issues.

I now recognize Chairman Rohrabacher, then Ranking Members Geren and Hayes for their opening statements.

OPENING STATEMENT

THE HONORABLE PETE GEREN
RANKING MINORITY ON THE SUBCOMMITTEE ON BASIC RESEARCH

HEARING ON THE GALVIN TASK FORCE REPORT ON THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES

I would like to commend Chairman Rohrbacher and Chairman Schiff for convening this hearing on the Galvin Task Force report and the GAO report on the Department of Energy's National Laboratories. Both reports are thought-provoking, and remind us that most problems don't go away unless you do something about them.

Over the last 20 years, many reports have called for a refocussing of the mission of the National Laboratory system and a streamlining of its management, including the Packard Report in 1983. But, as Fermi National Laboratory Director, John Peoples, said in his written testimony for today, "the Galvin Report substantiates the view that things have actually become worse in the last 12 years since the Packard report." That is a damning statement of our ability as a government to effectively manage our assets, and I hope that we can improve on our record.

Dr. Peoples also says that he has reason for optimism because of the efforts of the Secretary to address these problems. I look forward to her testimony because I also am striving for optimism these days. I hope that this Committee and the Secretary can work together to strengthen the National Laboratory system, and I look forward in particular to the legislative efforts of this Committee to address the future of the National Laboratories. Thank you.

OPENING STATEMENT
CHAIRMAN DANA ROHRABACHER
JOINT SUBCOMMITTEE HEARING
ON THE GALVIN REPORT
MARCH 9, 1995

Mr. Chairman, the Galvin Report has made a valuable contribution in helping our national laboratories make a needed transition with the end of the Cold War--as far as it goes.

The report helps point us in the right direction through many of its recommendations--the need for the Labs to focus on its core missions, the need for downsizing, a reduced DOE bureaucracy and a proposal to remake the lab management system into a private-sector style corporate body.

What the report does not do is tell us how we get there. It pulls back when it gets to specifics. Remarkably, it also does not recommend a single lab closure or consolidation. I am pleased that we have both Secretary O'Leary and Mr. Galvin here today to help flesh out these proposals as well as the Lab Directors to give us their view of implementation.

Mr. Chairman, it is not surprising that agency micromanagement was found to be a major problem by Mr. Galvin and his task force. Government is wedded to micromanagement as a drunk is to a bottle of cheap wine and this Congress is ready to give some "cold turkey" treatment to break the habit.

But Congress has been equally at fault for resisting change. I read with interest that the former chairman of the Senate Energy Committee was horrified at the prospect of putting decisions "in the hands of business executives who normally make such decisions based on their potential for profit-making." This apparently was meant as an epithet. Senator Johnston just doesn't get it, Mr. Chairman. Perhaps that's why he's the former chairman.

This Congress is ready for change. With $200 billion deficits and the dollar going the way of the peso, the American people demand change. I look forward to exploring ideas for change at this hearing. Thank you.

Constance Morella

CONSTANCE A. MORELLA
SCI/BR HEARING
RE: GALVIN REPORT ON DOE LABS
MARCH 9, 1995

I want to commend both Chairman Schiff and Chairman Rohrbacher, for their leadership on national laboratories. As the Chair of the Technology Subcommittee, they know that I share their interest in strengthening our national laboratories, especially in improving and streamlining federal technology transfer from the labs. I look forward to working collectively in the future with these chairmen on this important issue.

Our national laboratories are one of our nation's greatest assets. There are over 700 federal laboratories throughout the nation, occupying one-fifth of the country's lab and equipment capabilities, and employing one of every six scientists in the United States. Many Members on this committee, including myself, have laboratories in their district and can proudly boast of their accomplishments. I believe our national laboratories will be playing a vital role in enhancing our nation's ability to compete globally.

I am looking forward to receiving the testimony from Mr. Galvin on his Task Force's report, "Alternative Futures for the Department of Energy National Laboratories," which has taken on the vernacular, "The Galvin Report. I am also looking to find out more about the GAO report, "National Laboratories Need Clearer Missions and Better Management," and Secretary O'Leary's position regarding some of these constructive criticisms for change.

Mr. Chairmen, this hearing, in addition to future hearings which I hope to hold with you regarding the status of Congressional efforts to stimulate the transfer of technology from the laboratories to U.S. industry, will provide a healthy discourse for determining the future direction of our national energy laboratories. I look forward to hearing from our distinguished panelists.

Mr. SCHIFF. I don't want to go so fast, though, that I don't stop to acknowledge the importance of this hearing.

I want to say that I have had the opportunity, as a member of this Committee for the last six years, to spend a great deal of time studying, working with, and observing the Department of Energy's National Laboratory System, and I want to say that, without a doubt, that they are very important national assets.

Nevertheless, I think that every institution can run better. In that regard, I want to thank and commend Mr. Robert Galvin of the Galvin Task Force, for having made their study and presenting it to the Congress and presenting it to the Department of Energy.

It is the Galvin Task Force that we are prepared to study today, through this hearing, and I want to ask unanimous consent that the Galvin Commission Task Force Report be made part of this record. Without objection, it is so ordered.

I also ask unanimous consent to add to the record the General Accounting Office Report of January 1995 entitled "Department of Energy National Laboratories Need Clearer Missions and Better Management," and I want to conclude by personally welcoming Secretary of Energy Hazel O'Leary to testify before us today, and Mr. Robert Galvin.

With that, I would recognize, for opening statements first, Congressman George Brown of California, the Ranking Democratic Member of the Full Committee.

Mr. BROWN. Thank you very much, Mr. Chairman. I will be very brief.

I appreciate your disciplined and judicious approach to this hearing, and I compliment you on it.

I have looked at the reports about the Department of Energy's laboratories, and I think there's pretty much of a consensus that we're dealing with an asset of tremendous value to the country, and that it needs to be perpetuated in some form or other. I'm not going to belabor that form.

I do want to make one suggestion and that is that, as I think most of us know, we are also approaching some sort of a crisis in the conduct of research in the university system, in the research universities of this country.

I would like to suggest that there's a possibility of some synergism between the labs and the universities which perhaps need to be explored further.

There is going to be a shortage of employment opportunities for the continued output of university PhDs whose function is only to train more PhDs. We're going to need to provide alternate career paths, and some of that might be through the mechanism of the laboratory system as it evolves towards something perhaps closer to the research institutes that are so common in other countries, but not quite so much here.

And I would hope, and I intend personally to explore this possibility and I hope that others can do the same thing, to see that as the university research system evolves and the Department of Energy laboratories evolve, that there might be some commonality in that evolution that could benefit both of them.

With that, I yield back my time, Mr. Chairman.

Mr. SCHIFF. Thank you very much, Mr. Brown.

I would like to recognize now, for any opening statement the Ranking Member of my Subcommittee on Basic Research, Mr. Geren of Texas.

Mr. GEREN. Thank you, Mr. Chairman.

I'd like to join you in welcoming our distinguished guests this morning. It's certainly an honor for us to have you here today and we appreciate your being with us.

I'd like to commend Chairman Rohrabacher and Chairman Schiff for convening this hearing on the Galvin Task Force Report and the GAO Report on the Department of Energy's National Laboratories.

Both reports are thought provoking and remind us that problems don't go away unless you do something about them.

Over the last 20 years, many reports have called for the refocusing of the mission of the national laboratory system and a streamlining of its management, including the Packard Report in 1983.

But as Fermi National Laboratory Director John Peoples said in his written testimony for today, and I quote, "The Galvin report substantiates the view that things have actually become worse in the last twelve years since the Packard Report."

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Dr. Peoples also said that he has reason for optimism because of the efforts of the Secretary to address these problems. I look forward to her testimony, because I'm also striving for optimism these days.

I hope this Committee and the Secretary can work together to strengthen the National Laboratories System, and I look forward in particular to the legislative efforts of this Committee to address the future of the National Laboratories.

Thank you, Mr. Chairman.

Mr. SCHIFF. Thank you very much, Mr. Geren.

Let me again welcome our witnesses, Secretary of Energy Hazel O'Leary and Mr. Robert Galvin.

Let me say, one of the many things I have always appreciated about Secretary O'Leary is not standing on protocol when protocol would interfere with a more logical process.

As you all are aware, protocol would insist that a Cabinet member be a panel by himself or herself, and if in a joint panel with someone else for some reason, speak first.

In this particular case, however, the main purpose of this hearing is to examine the Galvin Commission Report. And therefore, I think it makes sense to begin with Mr. Robert Galvin first, and then to invite the Secretary of Energy to respond.

Mr. Galvin, let me welcome you here personally. Thank you again for the time that you and your other Commissioners devoted to this subject. We are all very grateful.

Let me say that any written statement you might have prepared, without objection will be made a permanent part of the record of this hearing. Let me invite you to proceed as you would like to do so.

STATEMENT OF MR. ROBERT GALVIN, CHAIRMAN, TASK FORCE ON ALTERNATIVE FUTURES FOR THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES [CHAIRMAN OF THE EXECUTIVE COMMITTEE OF MOTOROLA, INC.]

Mr. GALVIN. Thank you very much, Mr. Chairman. My appreciation to Hazel O'Leary for her concept of having this task force, and for her protocol decision this morning.

I would like to take the time, sir, to read about a nine-minute statement that attempts to summarize our activities, and I think seeds of the class of discussion you want to have.

I do identify myself—Bob Galvin—I'm the Chairman of the Task Force. We were requested by the Secretary of Energy's Advisory Board to prepare these proposals over a period of one year.

I am a businessman who has spent 55 years with one high technology company, and have rubbed shoulders with scientists and engineers in that capacity and in a variety of pro bono jobs at the Federal level.

The 22 other members of the Task Force were named by the Secretary, as indeed she named me. Their competence is exceptional. Most devoted extraordinary time. They brought related sophistication, firm forthrightness and convictions, as well as collegiality, in bringing synthesis to this subject. Though each of us retained certain biases, we found no need for minority filings, and have substantial agreement on the issues.

The Task Force respectfully suggests that the only way to fully understand the aggregation of its 80 to 100 proposals, depending on how you classify the topics, is to study the entire text, of which you have copies.

We did not compose an executive summary because the broad and integrated factors cannot be usefully summarized in sound bites.

However, as a guide, we provide a special extra copy of the text. It has underlinings that allow at least a first scan to get the flow and the location of topics. We prepared this for announcement day introduction efficiency. It may assist you, as may this document, that lists the multiple suggestions in a shorthand litany, form-keyed to the pages.

The futures for the laboratories should and do derive from the past. They have been and are a national security role, an energy role that includes environmental factors and related science and engineering, an environmental cleanup role, a science and engineering role, an economic role, though the deemphasis on general industrial competitiveness.

The primary national security mission is to provide for a safe, secure, and reliable nuclear stockpile in the absence of explosive testing for nuclear weapons and many other derivative and decommissioning factors.

The primary energy mission is to pursue a research and technology development agenda which enhances the long-term prospects for adequate energy supplies and efficient end use technology which minimizes adverse environmental impacts.

The environmental cleanup role represents a monumental task in dealing with the radioactive and hazardous wastes at former nuclear weapons production sites and laboratories. This task cannot be addressed in an affordable fashion using today's technologies. The National Laboratories have, or can develop, the technology which is urgently needed for a cleanup mission.

The National Laboratories must serve a broad scientific and engineering mission which underpins the Department's above-cited mission areas and certain discrete areas such as high energy, nuclear and condensed matter physics.

The economic development role should be focused on those parts of the economy and industries that fall within the basic mission areas. Any other general benefit should be viewed as a derivative from the core missions. Development of technology for private sector companies in other areas should not be a prime mission.

We take some 50 pages in our report to expand and elucidate on the substance and subtleties of the missions that I've just related.

Four obvious audiences of this report are the contractors, the Laboratories, the Department, and the Congress. To help seed the discussion at this hearing, let me distill some elements of this report addressing each of these audiences.

To the contractors, we simply say, you universities and/or private entities, do yeoman work. You may serve in various capacities in the future.

To the Laboratories, we say, you are important. You are capable. You must emphasize broad-based R&D long-term, but you need better focus within your core missions. You must be allowed to renew at the periphery of your missions.

You lab directors have to have greater discretion on new R&D related to those missions. Your work should be balanced with university research, and you should coordinate with industries that relate to your missions. But, you should act more as a system. Approach being a single, virtual laboratory. Establish lead labs.

You should net your computers further. You should establish centers of excellence. You should be allowed to operate to quality systems like industry.

You can improve functions. You can shave redundancies. Many dollars can be saved if you are allowed to operate to the efficient standards that we know you can ably manage. Your national security budget can be resized.

Lawrence Livermore national security missions can be reduced. You should continue to do non-defense R&D. You need not report to the Department of Defense.

Continue R&D on accelerator based production of Tritium. We'd like you to have a greater role in the environmental remediation science and solutions and be available to all.

You will profit from using more technology roadmaps and you are capable of being worthy of greater trust in a new governance system.

To the Department, we say, you have been pressed into a micromanagement mode. You must get out of the labs' way. The labs' quality systems must be allowed to flower.

Major laboratory facilities and equipment, some of which we list in this report,deserve full support. There are many energy potentials and these must be prioritized.

Stay a positive course on fission energy. Better integrate R&D and remediation and plan for further cooperation with others on this assignment.

Establish an industrial ecology board. Establish an environmental advisory board. You'll have to renegotiate the environmental agreements with the communities and states and must find a way of convincing our publics to balance risks, the reality of the possible and of course your dedication to a sense of urgency regarding cleanup.

Sustain and emphasize your dedication to long-term research and development. De-emphasize industrial competitiveness outside of prime mission areas. Redefine CRADA standards, the what and the who that are allowed as CRADA partners.

Reduce cost recovery fees. Fund facilities separate from programs at least until the governance issue is settled.

Radically streamline your management and upgrade the remainder personnel in their new roles.

To you, the Congress, our message is direct. First, we encourage you to embrace a major energy agenda for the country and reconfirm the support for the national defense objectives which will be obligations for a minimum of two score years.

Hopefully, you will support the Laboratories and the Department on those duties and missions already recited, but we particularly bring to your attention that the system of governance of the labs is broke. The Laboratories did not break it.

In the Task Force's judgment, the responsibility rests first at the feet of Congress and second at the feet of the Department.

Congress has mandated too much of the how to do, too much of the detail of what to do, too much accountability. It breeds micromanagement and has intimidated the Department to oppressibly impose excess accountabilities and micromanagements on the Laboratories.

The real waste in the system derives from the above. This as much as doubles the costs of what could be an efficient and an effective laboratory system.

The primary organizational recommendation of the Task Force is to corporatize the labs. That is described in some detail in the report.

The Congress should set broad objectives and let the laboratory professionals do the rest.

The Congress must find a way of showing its endorsement of quality systems as the private sector has been learning to do. This involves getting out of the way of the doers.

We recommend that you allow a studied, clean-sheet of paper approach to a better system including general block-like funding over multiyears as a modest size, progressive experiment in how Federal functions might be better achieved in the 21st century. That will be a global century and we encourage inviting foreign funding in the labs and relaxing that policy that substantially limits the use of R&D results only to the United States.

We make no recommendation closing labs or moving any to the Department of Defense. We believe you should support repair and modernizing of the facilities.

This governance proposal is acknowledged to be bold. It is our preferred solution versus the continuation of the GOCO system. But if the GOCO system is obliged, the second appendix in our report specifies the changes that can contribute to some renewal of the viability of the system. The evidence of the faults in the system are illustrated with a few of what could be thousands of anecdotes in the first appendix.

We urge the Congress to take a fresh, bold look at enabling the laboratories to serve their important future responsibilities in a more effective and efficient way. I thank you.

[The prepared statement of Mr. Galvin follows:]

WRITTEN TESTIMONY

OF

ROBERT W. GALVIN
CHAIRMAN

OF THE

TASK FORCE ON ALTERNATIVE FUTURES
FOR
THE DEPARTMENT OF ENERGY NATIONAL
LABORATORIES

BEFORE

THE
HOUSE SUBCOMMITTEE ON BASIC RESEARCH

AND THE

HOUSE SUBCOMMITTEE ON ENERGY AND
ENVIRONMENT

OF

THE HOUSE COMMITTEE ON SCIENCE

March 9, 1995
Washington, DC

My name is Bob Galvin. I am the Chairman of the Task Force on Alternative Futures for the Department of Energy National Laboratories. We were requested by the Secretary of Energy's Advisory Board to prepare these proposals over a period of one year.

I am a businessman who has spent 55 years with one high technology company and have rubbed shoulders with scientists and engineers in that capacity and in a variety of pro bono jobs at the Federal level.

The 22 members of the Task Force were named by the Secretary. Their competence is exceptional. Most devoted extraordinary time. They brought related sophistication, firm forthrightness and convictions as well as collegiality in bringing synthesis to the subject. Though each of us retained certain biases we found no need for minority filings and have substantial agreement on the issues.

The Task Force respectfully suggests that the only way to fully understand the aggregation of its 80-100 proposals, depending on how you classify topics, is to study the entire text. We did not compose an executive summary because the broad and integrated factors cannot be usefully summarized in sound bites. However, as a guide we provide a special extra copy of the text. It has underlinings that allow a first scan to get the flow and the location of topics. We prepared this for announcement day introduction efficiency. It may assist you as may this document that lists the multiple suggestions in a shorthand litany keyed to pages.

* * *

The futures for the laboratories should and do derive from the past. They have been and are: a National Security role, an Energy role that includes Environmental factors and related Science and Engineering, an Environmental Cleanup role, a Science and Engineering role, an Economic role, though with deemphasis on general industrial competitiveness.

The primary National Security mission is to provide for a safe, secure and reliable nuclear stockpile in the absence of explosive testing for nuclear weapons and many other derivative and decommissioning factors.

The primary Energy Mission is to pursue a research and technology development agenda which enhances the long-term prospects for adequate energy supplies and efficient end use technology which minimize adverse environmental impacts.

The Environmental Cleanup role represents a monumental task in dealing with the radioactive and hazardous wastes at former nuclear weapons production sites and laboratories. This task cannot be addressed in an affordable fashion using today's technologies. The national laboratories have or can develop the technology which is urgently needed for the cleanup mission.

The national laboratories must serve a broad Scientific and Engineering Mission which underpins the Department's above cited mission areas and certain discrete areas such as high energy, nuclear and condensed matter physics.

The Economic Development role should be focused on those parts of the economy and industries that fall within the basic mission areas. Any other general benefit should be viewed as a derivative from the core missions. Development of technology for private sector companies in other areas should not be a prime mission.

We take some 50 pages in our report to expand and elucidate on the substance and subtleties of missions related above.

* * *

Four obvious audiences of this report are the Contractors, the Laboratories, the Department and the Congress. To help seed the discussion at this hearing let me distill some elements of this report addressing each of those audiences.

To the contractors, we simply say, "You universities and/or private sector entities do yeoman work. You may serve in various capacities in the future."

To the laboratories, we say, "You are important. You are capable. You must emphasize broad-based R&D long-term but you need better focus within your core missions. You must be allowed to renew at the periphery of your missions. You lab directors have to have a greater discretion on new R&D related to those missions. Your work should be balanced with university research and you should coordinate with industries that relate to your missions. But you should act more as a system, approach being a single, virtual laboratory. Establish lead labs. You should net your computers further. You should establish Centers of Excellence. You should be allowed to operate to Quality Systems like industry. You can improve functions. You can shave redundancies. Many dollars can be saved if you are allowed to operate to the efficient standards that we know you can ably manage. Your national security budget can be resized. Lawrence Livermore national security missions can be reduced. You should continue to do nondefense R&D. You need not report to the Department of Defense. Continue R&D on accelerator based production of Tritium. We'd like you to have a greater role in the environmental remediation science and solutions and be available to all. You will profit from using more technology roadmaps and you are capable of being worthy of greater trust in a new governance system."

To the Department, we say, "You have been pressed into a micromanagement mode. You must get out of the labs' way. The labs' Quality Systems must be allowed to flower. Major laboratory facilities and equipment, some of which we list in this report, deserve full support. There are many energy potentials and these must be prioritized. Stay a positive course on fission energy. Better integrate R&D and remediation and plan for further cooperation with others on this assignment. Establish an Industrial Ecology Board. Establish an Environmental Advisory Board. You'll have to renegotiate the environmental agreements with the communities and states and must find a way of convincing our publics to balance risks, the reality of the possible and of course your dedication to a sense of urgency regarding cleanup. Sustain and emphasize your dedication to long-term research and development. De-emphasize industrial competitiveness outside of prime mission areas. Redefine CRADA standards, the what and the who that are allowed as CRADA partners. Reduce cost recovery fees. Fund facilities separate from programs at least until the governance issue is settled. Radically streamline your management and upgrade the remainder personnel in their new roles."

To you the Congress, our message is direct. First we encourage you to embrace a major energy agenda for the country and reconfirm the support for the national defense objectives which will be obligations for a minimum of two score years. Hopefully you will support the laboratories and the Department on those duties and missions already recited but we particularly bring to your attention that the system of governance of the labs is broke. The laboratories did not break it. In the Task Force's judgment the responsibility rests first at the feet of Congress and second at the feet of the Department. Congress has mandated too much of the how to do, too much of the detail of what to do, too much accountability, it breeds micromanagement and has intimidated the Department to oppressibly impose excess accountabilities and micromanagements on the laboratories. The real waste in the system derives from the above. This as much as doubles the costs of what could be an efficient and an effective laboratory system. The primary organizational recommendation of the Task Force is to corporatize the labs. That is described in some detail in the report. The Congress should set broad objectives and let the laboratory professionals do the rest. The Congress must find a way of showing its endorsement of Quality Systems as the private sector has been learning to do. This involves "getting out of the way of the doers." We recommend that you allow a studied, clean-sheet of paper approach to a better system including general block-like funding over multiyears as a modest size, progressive experiment in how Federal functions might be better achieved in the 21st century. That will be a global century and we encourage inviting foreign funding in the labs and relaxing that policy that substantially limits the use of R&D results to only the United States. We make no recommendation closing labs or moving any to the Department of Defense. We believe you should support repair and modernizing of the facilities."

This governance proposal is acknowledged to be bold. It is our preferred solution versus the continuation of the GOCO system. But if the GOCO system is obliged, the second appendix in our report specifies the changes that can contribute to some renewal of the viability of the system. The evidence of the faults in the system are illustrated with a few of what could be thousands of anecdotes in the first appendix. We urge the Congress to take a fresh, bold look at enabling the laboratories to serve their important future responsibilities in a more effective and efficient way.

Thank you for this hearing.

Mr. ROHRABACHER. Mrs. O'Leary would you like to give your presentation at this time? As you can see, you have a new Chairman, but Steve and I are co-chairing this. I want to apologize for being late. I hope that once we discover the secrets of producing more and more energy at a cheaper level, that we will also discover how to cure the flu bug that goes around, and I'm afraid it hit me. That's why I'm late.

Mrs. O'Leary.

STATEMENT OF THE HONORABLE HAZEL O'LEARY, SECRETARY, UNITED STATES DEPARTMENT OF ENERGY, WASHINGTON, D.C.

Secretary O'LEARY. Thank you very much. I appreciate this opportunity to testify before this Committee, and I'm well aware of my obligation to very briefly summarize my formal remarks.

I would ask each of you, in reviewing those formal remarks, to pay very careful attention, when you have the time, to an appendix which outlines clearly the Department's position on 29 generic recommendations coming from the Galvin Task Force.

You need to know that we firmly embrace 24 of those recommendations, and have some disagreement or opposition to the others.

Having stated that, I now need to say publicly, and would like to as often as possible, how grateful I am to Bob Galvin for this leadership. Also to the members of this task group serving the Secretary of Energy's Advisory Committee, who gave freely of their time and energy in a way that is unique, in my experience, with outside citizen groups working to advise its government.

In this regard, I think it's important for you to clearly understand that I sought this review, and most importantly, in asking Bob Galvin to take on the extraordinary task of providing its leadership and shaping the three separate Subcommittees and a separate Subcommittee on governance.

I indicated to him and every member of that Advisory Committee that I wanted this to be an independent review. I think that all members of the Advisory Committee will share with you that this Secretary of Energy tampered not one bit with its work and its work with our colleagues from the National Laboratories, many of whose directors will appear on panels, and I consider colleagues of mine.

One of the interesting outcomes of this work, I think we would all admit, is a much stronger team existing between the Department of Energy and its ten largest laboratories.

For that work alone, your nation should be grateful, but more important we are grateful for the very hard look and the excellent recommendations that have come from this task group.

I need to put this work within context because just as I asked Bob Galvin to undertake this unique look at our National Laboratories, we have other work on-going, almost from the day that President Clinton gave me the honor of serving as Secretary of Energy, the first of which was to define a strategic plan for a Department of Energy now facing the realities of a post-cold war, and asking ourselves what were our vital missions as we move forward into a very new 21st century where there would be a requirement for national security, but quite different, as we are now trying to dismantle weapons and non-proliferation becomes our goal, as does a strategic and scientific stockpile and stewardship at a time when our President has asked us to continue the moratorium on testing.

That strategic outline for the Department of Energy into the 21st century was developed, not by the Secretary of Energy alone, but with key leadership in the Department of Energy family of which the lab directors played a vital role, as did our contractors.

It's important to point that out, because the last time an advisory group sought to guide another Secretary of Energy about the roles for the National Laboratories, that group concluded it would be impossible to do that until the strategic mission of the Department of Energy was clearly defined.

Having done that, I believe the Galvin Task Force work has been better informed, and most importantly, in my view, its language endorses the strategic business lines of the Department of Energy in national security. Certainly science and technology, which is the very heart and soul, the core of what we do, as these ten National Labs represent today, our work in cleanup from the legacy, of now 48 years, of struggling to win World War II, and then the Cold War. Our work in energy resources, and we are beginning to make it a bit cheaper and certainly more available, though we haven't yet tackled the flu. Those are, in my mind, the four key business line areas much changed from the year 1979 when we were first at the advent or the creation of the Department of Energy.

You need to hear another comment from me, and that is the derivative mission which we used to call industrial competitiveness, which we are now calling economic productivity.

In my mind, the work of the Department of Energy must be measured against many things. But if we do not, as a system or an organizational entity, focus on these core missions and also add value in terms of quality of life, certainly in terms of informing knowledge and answering the imponderable questions that basic science answers, we also need to be able to measure results.

And one of the ways we do it, and I believe it's the correct way, as a derivative, is to ask ourselves, what have we contributed to the expansion of the economy of the United States of America and its competitive position internationally, as that becomes a bigger question in my mind and affects our national security.

Very briefly, I would like to walk through the recommendations of the Galvin Task Force and to give you some impression of the areas where there is some disagreement on the part of the Secretary and the leadership of the Department of Energy. And it goes not to outcome, but it goes to process and substance.

The first would be under the national security business line. And there are two areas where we have some disagreement.

The first is the phase out of the weapons work at Lawrence Livermore. We're qualifying that we support, but we do support with some qualifications. That is, we don't disagree and we're not certain that we can embrace the recommendation that the phase-out of that work occur over five years. I tend to be examining the position, and feeling very comfortable with it, of Sid Drell, who has much studied these issues as well, who indicates that perhaps a ten-year phase out might be a better position.

It occurs to me that there is some appropriate balance between the five years recommended by the Galvin Task Force and the ten years which has been suggested by others who know our weapons laboratories.

By April 13th, we'll have a firm response to that recommendation, but I thought it important for you to hear about it. And I know you will hear about the subject when the panel with the weapons lab directors testifies before you today.

We oppose the recommendation that says that no more production or funds for production is required. Now, I'm certain that the Task Force did not mean that because in one of their paragraphs in the section went on to discuss the requirements to produce an alternative source for tritium. That is in fact a production element, there are others required, and we know that we have already a number in our budget for fiscal year 1996 for tritium production source.

There will be other refinement work necessary as we go forward because while we are downsizing the stockpile, there is still a need to produce those components to keep our stockpile safe and reliable.

In the area of weapons site cleanup, we have two disagreements with the Task Force. One indicates that improvements in DOE management of this program is needed, and of course we agree with that. I'm a newly arrived student of quality, and embrace the concept of continuous improvement.

What we disagree with is the language that tends to leave one with the impression that there has been no senior management attention to that program.

I would tell you that not only has there been senior management attention to the program but, in fact, in the two years that we've been running the program, we can point to real and meaningful results on cleanup.

And I said I didn't want this board but now it appears I need it desperately. We don't talk about this enough, and this is why I'm using this board. In the area of cleanup, we can, in the past 18 months, point to 5,000 uranium contaminated properties totally cleaned up, down on our watch. Sixteen former nuclear weapons and industrial sites cleaned up.

We don't talk about that. You need to hear that. Fourteen uranium mill sites cleaned up. The job is finished. And a hundred facilities that were contaminated when we arrived that are now decontaminated.

Moving dirt and treating waste water, not highly sophisticated, but something that needs to be done. And if you're living near one of our sites, and your constituents do, you want us to do this work.

This past year, we moved 30 million cubic meters of soil and uranium tailings away from these sites, away from workers, away from citizens living nearby, and 4.2 billion gallons of waste water treated.

Finally, perhaps most importantly as we move forward with this very expensive and long-term work, we are working on building trust at our sites with citizens who have normally been on the other side of a closed gate by opening that gate and sharing information, declassifying information that will permit them to join in the debate on safety, reliability, join in the debate on questions involving the sequence of cleanup.

And we further inform that by the creation of nine site-specific advisory committees, ensuring that citizens, both elected and those not in elected positions, but representing workers and citizens, have an opportunity to engage in this dialogue as we go forward, which, in my view, will be very important as we wrestle with the details of how we clean up what we know how to clean up. And at the same time, we attempt to renegotiate our standing tripartite agreements which are contractual agreements which the Department has legal responsibility to live up to.

The other area where we have disagreement is the suggestion that National Labs should play a larger role in defining and making contribution to the science and technology of environmental restoration.

Of course we agree that the labs should play a role. The labs already get 45 percent of the $336 million budget focused on the technology of cleanup. We're also clear on the fact that there is a place within this role for universities—important to do—and also for the private sector. And at issue is how we balance out that account so that the entities which have the best technical capability inform the system and, at the same time, how we get the best bang for the buck.

And now my Assistant Secretary for Environmental Management tells me that his major concern is that the labs may be a bit more expensive sometimes than the private sector. That needs to be balanced off against the clear edge that the laboratories have in putting together the complex, multidisciplinary teams that can advise this process.

You need to know that in this program, we have already named lead labs in the areas where we are most vulnerable.

In our spent fuel and plutonium cleanup and disposition of hazardous waste, which vulnerabilities were not identified when I arrived at the Department of Energy, which is other work that's been done in the two years that we've been at the job.

Another area where we have disagreement is in the idea that we need to separate the budget for facilities and research. We oppose that strongly and look to this Committee to help us inform ourselves on that process.

The thing we're concerned about is taking away the flexibility needed to keep program integrity when one is not certain, from year to year, what findings are. And if we dedicate specifically line item budgets to facilities and away from science and technology, in the long run we may not be making the best decision as we balance against how we manage these facilities and the science, when there's little money to spend. That issue needs further examination.

Finally, on the big and the most visionary recommendation coming from the Galvin Task Force to corporatize the National Labs, we oppose as delineated.

We have embraced, and indeed are working on the concept that's found in Appendix B that says, "simply manage these laboratories like a corporate entity". Much as we have learned to do in our work with Amtex, it's a piece that we are now working on.

And Charles Curtis, our Under Secretary, has taken responsibility for that. We will have an established laboratory operating board by the end of this month. We will have new rules of the road with respect to how we operate as a corporate entity, not as program stovepipes, and focusing on the strategic responsibilities of these labs is now an on-going piece.

We will reform the directives which measure feet, not inches. We will reduce them by 50 percent by the end of this year. We will have an external advisory committee on regulating our nuclear safety.

I convened its inaugural meeting this morning. I have charged it to provide me with guidance that I will share with this Committee and others by the end of this year. And we are certainly working now on reforming the audits and appraisals of each of these laboratory systems, and we are doing it with specific teams working with each of these laboratories because they are different, and they do not need a cookie-cutter audit.

Those things we're working on now for this reason: I believe, and the leadership of the laboratories believes that to corporatize this heart and soul of the Department of Energy immediately may do more harm to the system.

I have looked at the experiment in Great Britain and would suggest, with a great deal of humility, that if this is the way we want to go, then we perhaps ought to do it with one or two of the laboratories, so we do not suffer the experience of Great Britain, which is to turn these mighty instruments of basic science into job shops, which is something the Galvin Task Force has advised us not to do.

So I suggest that we want to tread on a visionary road, but we do not want to put all of these laboratories at risk while we test out the vision. And I suggest that with a great deal of humility, and understand the great care and the pride which Bob Galvin has taken in trying to help us find a way to unleash these laboratories. I agree that that needs to be done. In the interim, while you determine as a legislative body what is the appropriate route to take, I want to assure you that we will continue to work with this advisory board and intend to have an external advisory committee advising the work that we're doing in establishing a governance board.

We very much look forward to working with this Committee as the Department begins, as I have attempted to outline in this relatively complex guidance, on how we are attempting to bring the Department of Energy into the 21st century, both as a managing entity and one that thinks.

We very much look forward to working with you, and I thank you for this opportunity to outline our response.

[The prepared statement of Secretary O'Leary follows:]

Statement of Hazel R. O'Leary

Secretary of Energy

Department of Energy

Before the

Subcommittee on Basic Research

and the

Subcommittee on Energy and Environment

of the

Committee on Science

United States House of Representatives

March 9, 1995

Mr. Chairman and members of the Subcommittees, I am pleased to appear before you today to provide testimony on the report of the Task Force on Alternative Futures for the Department of Energy National Laboratories, which was chaired by Bob Galvin. We commend the work of the Galvin Task Force, which dedicated an enormous amount of time and effort over the past year visiting and learning about the Department's National Laboratories. The Galvin Task Force members collectively spent thousands of hours visiting with lab and Departmental officials, Members of Congress, senior Administration officials, community leaders and the public. They took their task seriously, for which the Nation owes its gratitude. The issues which this Task Force faced were difficult, yet they addressed them directly and creatively.

Yesterday, we submitted a report to the National Science and Technology Council which demonstrated that, with a few exceptions, the Department has embraced and is committing to act on the overwhelming majority of the recommendations of the Galvin Report. We have provided specific commitments and deadlines for 25 of the Galvin Report's 29 specific recommendations, and explained why we object to or have not yet developed a position on the remaining four recommendations. I believe these actions speak for themselves as a demonstration of the seriousness with which the Department is responding to the Galvin Task Force report. Before discussing detailed elements of the Department's response, however, I would like to describe how the Galvin Task Force effort fits within a spectrum of self-examination and reform activities that we have been pursuing for the past two years.

Creating A New Department of Energy

The past two years have been an intense period of internal reform, organizational change, and fundamental rethinking at the Department of Energy. Never in the history of the Department has such an ambitious set of initiatives been pursued for the purpose of improving the performance, cutting costs, and fundamentally reshaping our business activities. Six separate yet overlapping initiatives--of which the Galvin Task Force is one--have served as the embodiment of our desire to create a new Department of Energy.

1. Strategic Plan: Fueling a Competitive Economy

In the spring of 1993, we initiated the most comprehensive strategic planning effort ever undertaken by the Department. Through a lengthy and intensive process involving hundreds of employees from all parts of the Department, its laboratories and facilities, a strategic plan was developed which presents a shared vision for the Department into the 21st Century. Through this process, we achieved broad recognition of the centrality of the Department's science and technology programs to successful execution of all our missions. As a result of the plan, it became increasingly clear to all that the DOE laboratories provide our primary capacity for mission accomplishment. In addition, we sharpened the strategic focus and priorities for our core missions in energy, national security, environment, and fundamental science, and we resolved that the impact of these missions on industrial competitiveness was a critical success indicator.

2. Strategic Alignment

The Strategic Alignment initiative represents Phase-II of our strategic planning process, and is expected to introduce some of the most dramatic changes in the way the Department conducts its business since the DOE was established in 1977. This intensive 120-day effort will culminate on April 29, 1995, with recommendations on how to minimize layers and complexity of management in the Department, eliminate unnecessary and redundant functions, reduce the cost of DOE programs, restructure the Department, and align our organization with the Strategic Plan--so as to better serve our customers. The Strategic Alignment process is one of the mechanisms for implementing recommendations of the Galvin Task Force. The Department is committed to saving $2.8 billion from efficiency improvements and cuts to lower priority programs over five years through Strategic Alignment.

3. Contract Reform: Making Contracting Work Better and Cost Less

Through our contract reform initiatives, begun in spring 1993, we have made enormous strides in carrying out the missions of the Department at lower cost and with fewer employees. This effort has consisted of an intensive examination of how we managed and what we expected from the management and operations (M&O) contractors of the Department's numerous labs and facilities. In June 1993, we established a Contract Reform Team, under the leadership of Deputy Secretary Bill White, to develop a plan for significantly improving the Department's contracting practices. The Contract Reform Team produced a report in February 1994. The report set the stage for a shift to performance-based management contracting and for enhanced competition for contract continuation. Over the next few years, we will compete and/or restructure more than $40 billion worth of contracts in all. On the basis of the contract reforms already implemented at some of our facilities--such as Idaho National Engineering Laboratory--we believe significant savings as well as improved effectiveness will result from this initiative.

4. Galvin Task Force on Alternative Futures for the DOE National Laboratories

As the Strategic Plan was nearing completion, we formed the Task Force on Alternative Futures for the Department of Energy National Laboratories and tasked it with the job of conducting the first post-Cold War assessment of the National Laboratories. We intentionally constituted the Task Force with independent thinkers from industry, academia, and the public. My selection of Bob Galvin was specifically aimed at ensuring that an experienced business perspective be brought to questions involving the future of our largest laboratories. The Galvin Task Force was formed on February 2, 1992. I asked Bob to report back to the Department within one year. On February 1, 1995, he met that deadline by presenting the results of his Task Force's efforts to the Secretary of Energy Advisory Board.

5. Yergin Task Force on Strategic Energy Research and Development

In the search for a similarly-independent assessment of the Department's energy R&D programs, in October 1994 we established a Task Force of senior energy experts under the leadership of Daniel Yergin, the pulitzer prize-winning author and President of Cambridge Research Associates, Inc. The Yergin Task Force is deep in the process of examining the Department's $1.8 billion portfolio of applied energy programs, and is committed to report in June 1995. The Department is committed to saving $1.2 billion in our applied energy programs over five years, as part of the $10.4 billion in savings over five years announced by the President in December 1994.

6. Advisory Committee on External Regulation

The final initiative in this package of self-examination efforts is the Advisory Committee on External Regulation of DOE Nuclear Safety, announced on February 16, 1995. The first meeting of this Advisory Committee began this morning, and will continue through tomorrow. I will discuss this effort in a few moments, in the context of our response to the Galvin Report, wanted to identify this effort up front in connection with other major initiatives which will affect the future operations of the Department and its facilities.

Making Commitments and Accelerating Change

These six major initiatives demonstrate dramatic departures from the past. The actions flowing from them are facilitating historic change at the Department. It is important to see the Galvin Task Force within the context of these other efforts. Each of these initiatives as an action-oriented assessment, resulting in commitments, deadlines, and assignments that will contribute to continued improvements in delivering on the Department's missions. As you can tell from my testimony, this has been our approach in responding to the report of the Galvin Task Force.

The Galvin Task Force: Not Just Another Lab Study

When I announced the formation of the Galvin Task Force in early February 1994, the reaction from many was typified by a February 11, 1994, Science magazine article titled, "National Labs Under Review, Again." The article reported that the Department was forming "yet another" study of its laboratories, and generally questioned whether this study would be any different from the multitude of prior assessments of the DOE labs. One observer in the article was quoted as saying, "Every administration sets up a panel to review the national labs. The problem is that nothing is done."

Let me assure you today that we are acting. I have no interest in putting the Galvin report on a shelf and continuing with the status quo. We established the Galvin Task Force based on my personal understanding that changes needed to be made in the Department's laboratory system, both in our management of it and the composition of its work. We knew that the labs and the Department needed reorienting to prepare for the new world order, including the introduction of best business practices.

I specifically asked the Task Force to develop recommendations that challenged the Department and its laboratories to reach new levels of performance in meeting national needs. That is what I got, and as I have stated, the Department embraces and will aggressively act on the overwhelming majority of the Task Force's recommendations.

The balance of this testimony provides reactions to the Task Force report, as well as elements of our implementation plan. These actions were described in the Department's report to the National Science and Technology Council; additional implementation steps will be announced in early May, within the context of the final report of the Strategic Alignment initiative.

General Observations

Many reports have been issued over the years on the general subject of the National Laboratories. Some have focussed intensely on management issues; others have focussed principally on the missions of the laboratories. In very few cases, however, have any of these prior studies done as good a job as has the Galvin Task Force in providing a sophisticated treatment both of questions of management and mission. This welcome balance is important to note, because it recognizes that good management of the laboratories is simply a means to an end--and that the end, successful mission execution, depends on good management.

On the question of missions, the Task Force has clearly and forcefully validated the work of the DOE laboratories in the areas of energy, national security, environment, and fundamental science. According to the Task Force, "the laboratories' research role is part of an essential, fundamental cornerstone for continuing leadership by the United States." This statement is a compelling endorsement of the research performed within the DOE National Laboratories.

On the question of management, however, the Task Force could hardly have expressed greater alarm. They conclude that the existing system of governance--involving the Contractors, Department of Energy, Congress, and many others--is broken. We agree, and we plan to fix it.

Management Improvement Roadmap

Starting in December, and continuing through February, the senior management of the Department and the Directors of the DOE laboratories held several lengthy sessions aimed at creating a roadmap for improving management of the laboratories. Under Secretary Charlie Curtis provided vital leadership to these efforts. The purpose of the roadmap that has been developed is to help the Department and the laboratories work their way out of a thicket of cumbersome, inefficient, and non value-added interactions--developed over the past several decades--which, in the view of the Galvin Task Force, jeopardize the long-term quality and effectiveness of the labs.

Guiding Principles for Management of the Laboratories

The starting point for this roadmap is to define both an end state, or destination, and also the rules of the road that we plan to adhere to during the journey. For this purpose, we have developed an initial set of guiding principles that capture the essence of what we hope to achieve through implementation of the specific elements of our management improvement roadmap. These principles are:

1. Create a more productive, mission-focussed, and cost-effective Department and laboratory system.

2. Adopt best business practices throughout the system.

3. Require performance-based, results-oriented contractor accountability.

4. Work aggressively to achieve credible, external regulation and oversight.

5. Shift the balance of focus at the laboratories away from process compliance and toward mission success and results.

These principles are reflected in each of the elements we have identified and placed on our roadmap thus far. The roadmap elements, described below, will: 1) dramatically reform the DOE system of orders and directives, and their implementation; 2) secure better environmental, safety, and health performance at the laboratories at lower cost; 3) chart a path toward external regulation; 4) reduce the burden imposed on the laboratories by compliance-driven audits and appraisals; 5) implement an entirely new, "commercial best practices" procurement system for the contractors that manage the Department's laboratories and facilities; 6) establish within the Department a new, corporate-level governing structure for the laboratories; and 7) sharpen the focus of the laboratories on their areas of world-class expertise.

Reform and Reduce DOE Directives

The Galvin Task Force correctly notes that the Department's current system of directives is not working as an effective management tool. Directives are the means by which the Department establishes formal requirements and guidance for the conduct of work by employees of the Department and its contractor workforce. The current DOE directives system was created upon establishment of the Department in 1977, and was patterned after a model system developed by the General Services Administration and a working system implemented by the Department of Transportation. These directives cover the gamut of Departmental and laboratory functions, from environmental, safety and health requirements to infrastructure management to nuclear materials and classified document safeguards.

The DOE directives system was intended to help ensure that proper procedures are followed throughout the Department and its laboratories and facilities. The "drivers" behind the creation of the directives have included statutory requirements (ie. those necessary for Occupational Safety and Health Administration and National Environmental Policy Act compliance); congressional guidance emanating from the Committees of jurisdiction over the Department; internal Departmental determinations regarding necessary requirements for safeguards and security for sensitive facilities, materials, and documents; and findings by the General Accounting Office, the Defense Nuclear Facilities Safety Board, and other oversight bodies. Safety deficiencies identified by both internal and external reviews (General Accounting Office, Office of Technology Assessment, National Academy of Sciences, and others) also drove adoption of stricter standards.

During the late 1980s, as noted by several prior studies, the DOE directives system became increasingly complex and burdensome, and some would contend, dysfunctional. (The number of orders doubled from 1981 to 1992.) When we arrived at the Department in early 1993, symptoms of the problem included the following:

-- There were too many directives, with duplicative requirements and conflicting implementation guidelines.

-- It was not clear within the directives system whether various elements were requirements or simply guidance. Because of this uncertainty, all elements have been treated by the labs and their management and operations (M&O) contractors as requirements.

-- Neither requirements nor guidance were clearly connected to improved performance.

-- Excessive requirements had been developed and imposed with no disciplined assessment of the costs versus benefits of such requirements.

-- There was no systematic and periodic review, reassessment, and re-validation of existing directives, and sunset provisions were not employed.

-- Without any effort to establish priorities according to risk, compliance with the directives was exacting a greater and greater cost, without necessarily resulting in better performance.

Over the past 18 months, we have laid the groundwork for a complete overhaul of the DOE directives system--a legacy of the past which we inherited and are determined to fix. In terms of the numbers of DOE directives, we already have achieved important reductions. Since March 1994, the number of directives has been reduced by 25 percent (from 312 to 236) and we are committed to achieving a 50 percent reduction by December 1995--nine months ahead of the schedule we set for ourselves 18 months ago. Measured in terms of the number of pages involved, we have cut the universe of DOE directives from 7,200 pages to 4,400 pages (a stack of paper 4 1/2 feet tall to 3 feet) and will reduce this to 2,400 pages by mid-summer. (Attachments).

We fully recognize that numerical reductions such as this only provide part of the story. What really matters is whether these changes are reducing the burden (ie. cost, time, complexity) involved in implementation, while also facilitating excellence in performance. In this regard, we are committing to an aggressive schedule of actions that will result in a coherent, comprehensible, and less burdensome set of directives, which set forth unambiguous policy, provide clear distinctions between requirements and guidance, and which will eliminate unnecessary requirements.

Concentrating on the "26 Most Burdensome" Orders

Our starting point will be to address the 26 most burdensome and inappropriately prescriptive directives that we identified through a cooperative effort with our management and operations contractors. A total of 103 orders have been identified as targets for immediate attention, which captures the 26 burdensome and all related orders. Our commitment is to eliminate or restate these orders, thereby significantly reducing their burden, between now and mid-summer.

To achieve this goal, drafting teams have been established for each group of related orders. The highest priority directives among the 103 will be revised and circulated to the Department, laboratories, and contractors by April 17 (May 15 for the lower priority directives within this group). Final revisions of the highest priority directives will be issued by June 30, 1995 (July 31, 1995, for the lower priority directives). We plan to reduce these 103 orders to 42.

This is not simply an exercise in combining multiple directives. Rather, the total number of pages, the number of requirements, and the burden imposed all will be reduced. For example, 14 orders from our Office of Field Management will be reduced to one order--a reduction in the number of pages from over 1000 to under 20, and a drop in requirements from several thousand to less than 50. All of the remaining requirements will be modeled on successful private sector practices. It has been a tedious, time-consuming effort to work through the thick underbrush of these directives, thin them out, make them comprehensible, and ensure that they contribute to the desired objectives. Nonetheless, we believe that we are making significant progress in eliminating those elements of the directives that have been confusing, redundant, or unnecessary.

As the new directives are put into place, the Department will move toward a new system for implementing them and will also chart a course aimed at getting the Department out of its historic role of self-regulation.

Delegating Authority and Instituting Flexibility

Many elements of the Department's current directive system were driven by concerns about the highest risk elements within the Department (e.g. plutonium handling, weapons production, nuclear reactors), yet the Department supports an extremely wide scope of facilities--many of which are no different than exist in industry or academia. To move away from a "one size fits all" application of directives, in which a research accelerator is forced to address the same requirements as a weapons dismantlement plant, the Department will institute a "necessary and sufficient" process. Rather than starting with the universe of directives and determining whether a facility is complying with each and every element, an entirely different approach will be adopted.

We will begin by assessing the work to be performed, analyzing the hazards involved, and then determining the procedures that are "necessary and sufficient" to address those hazards. We will develop standards through an objective technical assessment of hazards. Once the standards are confirmed, the "necessary and sufficient" determination will be delegated to the lowest management level--as close to the work as possible--where work and resource management can be integrated.

Pilot programs at diverse facilities will be established from now through September to demonstrate the validity of the process for determining necessary and sufficient sets of standards. The results of these pilot efforts will be examined, then our expectation is to proceed with widespread implementation.

Charting a Path Toward External Regulation

There is a growing sentiment within the Department, at DOE laboratories and facilities, and by external observers--including the Galvin Task Force--that the Department should excise itself from its historic role of self-regulation. The Department's existing complex system of self-regulation emerged from the Manhattan Project, Atomic Energy Commission, and Congress in response to the urgency of the nuclear weapons mission and the need for secrecy at the weapons production complex and affiliated laboratories. The policy judgement of the Congress, expressed through the Atomic Energy Act, was to rely on a system of self-regulation by the Atomic Energy Commission, and its successor agencies, rather than to impose risks on the system from external regulation. However, with the end of the Cold War and general shut-down of the nation's weapons production complex, maintenance by the Department of a separate apparatus for self-regulation appears to many as being unnecessary. It will not be a simple matter, however, to achieve the transition to external regulation. In part because the Department's facilities are among some of the most hazardous in the world, involving large volumes of extremely toxic and volatile materials which demand constant attention.

Many environmental matters at the Department's laboratories and facilities currently fall within the regulatory framework of the Environmental Protection Agency, but other environmental, occupational, safety, and health matters, and nuclear safety, are "regulated" by the Department, as provided for under the Atomic Energy Act. Demonstrating our commitment to external regulation, the Department announced on February 16, 1995, the formation of an Advisory Committee on External Regulation of Department of Energy Nuclear Safety. Headed by John Ahearne, former Chairman of the Nuclear Regulatory Commission, and Gerard Scannell, former Assistant Secretary for Occupational Safety and Health, this Committee has been tasked to provide recommendations to the Department regarding external regulation in an interim report within six months and a final report by the end of the year.

Serious and complicated issues will be addressed during this review, since the potential external regulatory bodies may not currently be equipped to address many of the unique facilities operated by the Department. As appropriate, we intend to establish pilot projects as soon as possible to help facilitate and inform the transition to external regulation.

Consolidate and Simplify DOE Audits and Appraisals

The DOE laboratories have been the victims of an investigative mentality pervasive within the entire body of organizations (e.g. Departmental, congressional, and external oversight groups) which have clear or perceived jurisdiction over the laboratories. This mentality grew out of discoveries of serious deficiencies in environmental, safety, and health management across DOE facilities. However, of late, too little effort has been made by oversight groups to coordinate their reviews, respect each other's findings, and assess the cost/benefit impact of their examinations of the laboratories. As noted in the Galvin Report, some of the Department's laboratories have experienced several hundred audits and appraisals per year. One attachment depicts a fairly representative story, in which Sandia National Laboratories has experienced a ten-fold increase in audits and appraisals over the past ten years, and more than a ten-fold increase in the growth of "person-days" involved--which captures only the time of auditors and appraisers, and not the corresponding time required of Sandia employees involved.

The current situation is exacting a price on performance and efficiency that is totally incommensurate with any perceivable benefits (e.g. enhanced performance, lower risks, increased safety) from this intense and inefficient level of oversight. Some have viewed the current situation as an "audit everything in sight" approach to managing the laboratories. As a result, each year the laboratories experience literally hundreds of redundant, uncoordinated, and unnecessary reviews, audits, and appraisals. Although many of these involve external bodies, over which we have no control, we know that the ones which the Department does own can be done in a much better way. And we will do it better:

-- The Department will immediately adopt a plan to reduce the impact on the laboratories of the audits and appraisals within its control. Specifically, we are committing to a Pilot Performance-Based Oversight Process for all of the Department's laboratories. To the maximum extent possible, oversight will be conducted on a performance basis--with requirements and oversight criteria clearly understood up front. And we will simplify and consolidate our appraisals wherever it makes sense to do so. Some prescriptive approaches are necessary, however, to comply with statutes.

-- Effective immediately, we will impose a moratorium on DOE reviews at the laboratories in regard to all aspects of the business practices of these facilities (e.g. procurement, information systems, project management, personal property, facilities management). Within 30 days, a team championed by our Associate Deputy Secretary for Field Management will define the scope and implementation of an entirely new approach to business practice reviews. Rather than repeatedly going into the laboratory throughout the year with audits and appraisals in these areas, the Department will consolidate all of these reviews into a single integrated business management assessment to be conducted at each laboratory once a year. The guiding purpose of these audits and appraisals will be to add value to the laboratories by helping to strengthen their systems for internal resource management and control. In areas where excellence is identified, it will be rewarded by reduction in the frequency or need for oversight.

-- A similar pilot project will be done for the internal environmental, safety, and health reviews run by the program offices of the Department. (As distinct from the independent reviews conducted by the Office of the Assistant Secretary for Environment, Safety and Health.) This effort will be championed by the Office of Defense Programs, with a plan to be in place within 90 days.

-- In addition, within 180 days, a team led by the Director of our Office for Energy Research will define the scope and implementation plan for simplified technical reviews conducted by our program offices.

The result of these efforts will be substantial. For example, an early estimate of the impact on Lawrence Berkeley Laboratory suggests that one annual multidisciplinary business practices appraisal will replace over a dozen separate appraisals that would have been conducted over the next year.

With all of these reforms, we will establish specific expectations and measures of performance to track our success in reducing oversight burdens, cutting costs, and enhancing performance.

Revolutionize the Procurement Practices for DOE Contractors

Another element of our Management Improvement Roadmap for the Laboratories involves a complete revision of our framework for evaluating the procurement activities of our management and operations (M&O) contractors. The objective will be to move away from an inefficient and bureaucratic model--which focusses heavily on process for its own sake--and toward widespread adoption of best commercial practices.

Unlike other contractors, the Department's M&O contractors have been expected to adhere to what is called the "federal norm" in procurement practices. The "federal norm" has been an extremely imprecise and evolving standard. Although the M&O's are not required to adhere to Federal Acquisition Regulations, per se, they have been expected to adhere to federal practices. Where there has been doubt, the M&O's have been forced to retreat to adopting procurement practices mirroring those of the federal government. As a result, contractor purchasing has, over the years, become increasingly Federal-like and less like efficient and effective commercial business practices.

Our sense is that we should be promoting the best in commercial practice by our M&O contractors, with the resulting efficiencies and cost reductions, and not expecting contractors to conform to a cumbersome Federal model. One of the primary reasons why we adopted a government-owned, contractor-operated (GOCO) concept in the first place was to take advantage of the more efficient and flexible business and management systems that M&O contractors would bring to the job of managing the laboratories. The "federal norm" approach to M&O contracting deprives the government from benefiting from the business acumen and experiences of our M&O contractors.

We believe the system needs to be fundamentally changed. To achieve this goal, on February 28, 1995, we sent to the Federal Register a Notice of Proposed Rulemaking to modify requirements for the M&O contractors purchasing systems, such that we will eliminate the application of the "federal norm" and replace it with a system that expects the use of best commercial practices. There will be a 60-day public comment period, and we would hope to issue a final rule this summer. The Department has identified certain purchasing system objectives and standards which it believes are common to world-class industrial purchasing activities, and will be assessing our M&O contractors' performance against those goals and standards. As a result, there will be more self-assessment, value-added analysis, benchmarking, and earned autonomy.

This approach is consistent with reforms underway in the entire Federal procurement system, and with the Government Performance Results Act.

Governance of the National Laboratories

The most provocative recommendation within the Galvin Task Force report is to "corporatize" the laboratories through the creation of a not-for-profit Board of Trustees, appointed by the President, that would receive multiyear block-funding from Congress. The principle rationale for such a radical change in governance is that such an approach might better insulate the laboratories from micromanagement and excessive oversight by the federal government.

We are continuing to examine the specific governance model in the Galvin Report, as well as other models ranging from maintaining the status quo through privatization of the laboratories. While we appreciate the novel thinking expressed in the Galvin Report, we are not persuaded that the specific model envisioned would be either practical in the near-term or sustainable over the long-term. Such a dramatic change in governance would require a level of national consensus on the merits of such a proposal which we do not believe currently exists, or is likely in the foreseeable future. We reach this view based on but a sampling of public comments and congressional reactions to the Galvin governance model. Numerous observers have suggested that it is unrealistic to believe that Congress would relinquish its authorities over such a large amount of federal R&D funding. Others have criticized the approach as failing to provide levels of accountability that normally are expected of public funds.

The Department shares many of the precautions imbedded in the report itself, on page 9, that state that such an approach could force these institutions away from long-term research and into a "job shop" mentality. Additionally, as the report indicates, there are risks that an effort to introduce a new system of governance could be used "as a political pretext to dismantle or destroy a system of laboratories which has served the nation well in the past, is continuing to perform important public functions, and holds the prospect for delivering new scientific insights and technological innovations which will justify its continued value to the Nation."

We must be extremely careful not to destroy the National Laboratory system in the name of trying to fix it. Given the uncertainties and risks involved, the Department's strategy will be to pursue a two-track approach to the question of governance of the National Laboratories. On one track, we will continue to explore options for changes in the framework for governance of the laboratories. Perhaps a model approaching what is discussed in the Galvin Report might emerge and will satisfy its critics. However, on a separate track we will move aggressively to improve the current system--thus striving to reach the same goals as envisioned for the Galvin model. This second track will involve aggressive implementation of our Management Improvement Roadmap (which will address the issues in Appendix B of the Task Force report), combined with establishment of a new, corporate-level board within the Department, and including external advisors, to provide high-level decision-making regarding the current and future operations and missions of the National Laboratories.

Create a Lab Operating Board within DOE

In a collective effort during the past month, senior management of the Department and the DOE Laboratory Directors have developed a management improvement concept--the creation of a DOE Laboratory Operating Board--which we believe will begin to address numerous governance issues identified in the Galvin Report. As such, our intention is to move expeditiously to constitute such a board.

One way of viewing the role of this new Lab Operating Board of Directors is to look at the structure of large private sector companies which involve a conglomeration of business lines, such as found at the National Laboratories. Dr. Alexander MacLachlan, former Senior Vice President and Chief Technical Officer for Dupont and currently the Department's Deputy Under Secretary for Technology Partnerships, has helped illustrate the important parallels between the Department of Energy and companies like Dupont. In so doing, he makes it clear that many of the types of issues that have received insufficient management attention by the Department are addressed within Dupont by a Corporate Technology Council. The Department currently has no such forum.

By March 31, 1995, the Department will formally charter a Laboratory Operating Board, to be chaired by the Under Secretary of Energy. Membership would consist of the senior management officials within the Department that utilize and impact the cost of doing business at the National Laboratories, as well as a subgroup of private sector advisors, who will be constituted as a standing panel of the Secretary of Energy Advisory Board. Members of the external advisory panel would be appointed to six year, overlapping terms in order to provide continuity and institutional memory through changes of Administration. This new Board would be expected to meet quarterly, and would have jurisdiction over issues such as:

-- High-level strategic direction for the laboratories, including validation of strategic plans, cross-cutting programmatic and management issues, and facility rationalization;

-- Overseeing the development and implementation of a Strategic Laboratory Mission Plan, which will include a mission statement for the entire lab complex and more tightly focussed missions for each of the laboratories; this Plan will serve as the framework for down-sizing and "rightsizing" efforts that would tailor laboratories to the size of their mission assignments;

-- Monitoring, expanding upon, and ensuring implementation of the Management Improvement Roadmap described in this testimony;

-- Cost-containment, including ensuring application of best business practices, addressing cost-benefit issues related to administrative and regulatory requirements;

-- Analysis and determination of Centers of Excellence and lead laboratory designations.

Through these authorities, the Lab Operating Board will play a major role in the issues of mission allocation and laboratory sizing raised by the Galvin Task Force. We plan on developing issue-specific subcommittees of this Board that would include senior career civil servants to help maintain continuity, and will constitute one standing subcommittee for the Laboratory Directors.

The Management Roadmap: Helping Achieve the Lab Missions

The Management Improvement Roadmap which we propose here is not an end in itself; it is simply a means to an end. The end that we are seeking to achieve is more effective and efficient mission activities of the Department and its laboratories and facilities. The Galvin Task Force correctly diagnosed the National Laboratories as a system under extreme stress--part of which has been caused by the burden of conflicting, contradictory, non value-added, and increasingly intrusive oversight and management of the laboratories. These burdens have increased the cost of doing business at the laboratories and impacted mission performance to a degree that is far in excess of the potential benefits. Management intervention by the multitude of parties who have an interest in prescribing how the laboratories should conduct their business should be radically simplified, rationalized, and--where appropriate--curtailed. The replacement framework should presume a level of trust, and should encourage accountability, self-assessment, and excellence. This will enable us all to focus on what really matters, which is the utilization of these national assets to help meet the energy, national security, environmental, economic, and scientific needs of the nation.

Mission Recommendations of the Galvin Task Force

Overall, the Galvin report serves as a strong validation of the core missions of the Department and the National Laboratories. The past performance of the National Laboratories and their significant potential for important future contributions are given notable attention. As noted below, however, the Galvin Report did not provide detailed R&D agendas within the Department's core mission areas. Such plans have been developed for the Department's national security activities, eased in part by the clarity of the customer-requirement equation which governs our stockpile stewardship and stockpile maintenance programs. Detailed strategic plans are not as well defined for the Department's energy, environmental, and science programs--but will be developed by the Department and reviewed by the Lab Operating Board over the next nine months.

Energy Research and Development

The Task Force provides a strong statement about the necessity of continued Federal support for energy R&D. They describe the important public purpose of long-term energy R&D, they conclude that "energy" is an important unifying focus for work at the National Laboratories, and recommend that Department do more to manage its energy R&D as a portfolio and to better integrate this work both internally, with fundamental science activities, and externally, with industry and academia. We agree with these views. Although the Galvin Report says that there exists "a long list of exciting, challenging, and vital areas of research and technology development that constitute the appropriate energy agenda for the laboratories," the report does not lay out in any detail the elements of that agenda. We did not expect it to do so, which is why we established a separate exercise--the Yergin Task Force, which I mentioned above--to provide a detailed assessment of our energy R&D programs.

The challenge that we face, however, is to help solidify political support for continued Federal funding for a broad array of energy-related R&D. Chairmen, Members of the Committee, we look forward to your help in this regard.

National Security

We are pleased by the Task Force's support for the Department's science-based stockpile stewardship program, including support for the National Ignition Facility. The Task Force correctly observes that the focus of our national security programs has changed dramatically as a result of the end of the Cold War, cessation of nuclear testing, consolidation of most of our nuclear weapons production complex, and new threats posed by the proliferation of weapons of mass destruction.

We agree with the Task Force that one of the most important priorities for our stockpile stewardship mission is to attract and retain skilled scientists, engineers, and managers over the years ahead with the expertise required for the complex and demanding stewardship role. We also agree that the starting point for assessing the future size, budget levels, mission focus, and configuration of the Department's three weapons laboratories must be the national security requirements established by the President. The Department will closely evaluate the Task Force's recommendations regarding a reduction of some of the nuclear weapons functions at Lawrence Livermore and their transfer to Los Alamos. We have an initial favorable disposition for a careful phase-down of some of Livermore's nuclear weapons work, combined with a re-emphasis on non-proliferation, counter-proliferation, and verification activities. However, our actions proceeding down this path--the timing and the details--must depend on assessments of how best to meet our continuing national defense requirements in a wholly new era.

Environmental Science and Technology

The Task Force describes the diversified environmental mission at the laboratories as including two traditional areas of activity and one emerging area. The traditional areas are science and technology development associated with the clean-up of nuclear waste, and R&D related to reducing the environmental impacts of energy use (e.g. global climate modeling, atmospheric chemistry). The emerging area involves systemic approaches to reducing energy and materials consumption both in specific industrial applications--such as through environmentally-conscious manufacturing--as well as for entire segments of the economy. Let me first focus on the traditional area of activity involving clean-up technologies and the Department's weapons site clean-up program.

The Task Force includes a critical assessment of the Department's Environmental Management program. We do not believe that sufficient effort was made by the Task Force to develop a full understanding of the strides we have made in directly addressing problems we inherited from the past. Over the past two years, we have worked to assess and to quantify the vulnerabilities at each site and have established both a national advisory board--which includes world-class scientists--and a host of site-specific advisory boards. We have taken--and are continuing to take--bold actions to cut costs, reinvent the program, and accelerate clean-up activities. We already have successfully implemented several of the Task Force's recommendations in this area, of which the Task Force apparently was unaware.

We agree that the science and technology base must be greatly expanded for this program. We also agree that there exist important opportunities to secure additional contributions from the DOE laboratories in this realm, particularly in the development of systems approaches to the stabilization and clean-up of some of our most hazardous wastes. Toward this end, we recently announced that the Idaho National Engineering Laboratory would be the Department's lead laboratory for mixed-waste cleanup efforts. The Pacific Northwest Laboratory has been given lead responsibility for developing technology needed to quickly, safely, and cheaply dispose of millions of gallons of radioactive wastes stored in underground tanks. Additionally, the Savannah River Technology Center, a program-dedicated DOE laboratory, has been named lead lab in landfills research. Also, Los Alamos Laboratory has been selected to serve as Lead Lab for research on technology gaps in stabilizing and packaging plutonium for interim safe storage and long-term storage leading to permanent disposal. These designations were made based on recognition of the expertise of these facilities in handling these challenging R&D issues.

The Task Force recommends that as much as $400 million annually, and eventually twice that much, should be provided to the laboratories to help develop the necessary clean-up technologies. (In FY 1995, the DOE laboratories will receive approximately $150 million (45%) of the Environmental Management program's $337 million technology development effort.) We will continue to examine this recommendation closely as we refine our strategies for accelerating the science and technology base for this program. However, we are not prepared to direct an arbitrary amount of increased funding to the National Laboratories in this area. Cost and performance of the labs vis-a-vis industry and academia must drive our decisions regarding the relative roles of these different R&D performers in the development of clean-up technologies.

Regarding the other environmental missions addressed in the report, we are in strong concurrence. We need to achieve greater integration and coordination between our energy and our environmental research programs. The Task Force states that the National Laboratories "should play a significant role--in collaboration with energy- and materials-intensive industries--in the development of environmental technologies and an enhanced understanding of resource utilization in the economy." The Task Force notes that the specific core capabilities of the National Laboratories in areas such as energy technologies, advanced manufacturing, materials science and technology, and modeling and simulation, provide the basis for a considerably enhanced contribution to emerging fields such as "industrial ecology." No specific research agenda is addressed, yet the Task Force commends the Department's existing work to define R&D agendas with several energy- and materials-intensive industries. More work will need to be done to develop a more refined agenda that might guide the laboratories activities in this area.

Fundamental Science

The Task Force provides an especially strong endorsement of our fundamental science mission, stating that the Department "should sustain and strengthen its support of fundamental science." The Task Force supports this work as being "essential to the fulfillment of our need to know," and also for its direct support to meeting the Department's missions. As the Task Force states it, "The national laboratories have a major mission to serve in contributing to the scientific foundation which underpins the Department's other mission areas."

This strong support acknowledges that the National Laboratories house powerful scientific instruments (e.g. accelerators, materials research facilities, supercomputer centers) that enable academic, industrial, and federal researchers to explore new scientific frontiers that could not be reached in any other fashion. These scientific facilities at the DOE Laboratories currently are used by more than 15,000 scientists representing 278 U.S. colleges and universities, 265 U.S. companies and 47 U.S.

laboratories. Scientists from 48 states conduct research at the National Laboratories, performing work that they could not do elsewhere. To sustain and strengthen this service to the nation, the President's FY 1996 Budget proposes a $100 million Science Facilities Initiative aimed at expanding utilization of the DOE user facilities. We urge your support for this initiative.

Industrial Technologies and Technology Transfer

The Task Force concludes that technology transfer/industrial competitiveness activities of the National Laboratories should be focused on industries and areas of technology that contribute directly to the Department's primary missions in national security, energy, and environment. We agree. Indeed, our view is that successful execution of our core missions increasingly depends upon involvement of the private sector through technology partnerships. Through such collaborations, we are achieving a vital leveraging of private sector resources toward meeting the public missions of the Department.

The Task Force expresses concern that industrial collaborations not be perceived as a primary mission activity. This is consistent with our view, which has also been that collaborations with industry be viewed as a derivative mission and critical success indicator of our other missions. Through its partnerships with industry, the Department helps to maximize the value of the public investment in these institutions by increasing the prospects of getting taxpayer-financed innovations to the marketplace, while also meeting DOE mission needs.

It is interesting to note that the Galvin Report does not contain any criticism about the culture of either the laboratories or the Department not being prepared for partnerships with industry. In contrast, a series of reports written over the previous decade primarily criticized the Department's laboratories for being too isolated from the rest of the nation's R&D enterprise. Those studies criticized the Department and the National Laboratories for not contributing enough to economic competitiveness, for having a culture that was incompatible with industry, and for being too slow in approving cooperative research and development agreements (CRADAs).

The Department made a major effort to address these concerns and I'm proud to say has made great progress. We have streamlined our processes and cut in half the time it takes to enter into CRADAs. The number of CRADAs has grown to over 1200, which involve commitments from our industrial partners of more than $1 billion.

The changes that we have made did not come easily or automatically, and can be attributed in part to the emphasis that we have placed on industrial partnerships being a high priority for the Department. The Galvin Task Force suggests that the Department has now overemphasized industrial competitiveness. But I believe that if we had not emphasized it as strongly, the Department would not have moved nearly as rapidly toward becoming a good partner. Moreover, I believe that the new concerns that the Task Force has raised are much less fundamental--and far easier to address--than was the earlier concern that our culture was simply incompatible with that of industry.

One of the reasons that we created an Office of Technology Partnerships in June 1994 was for the very purpose of ensuring that there was strategic focus and mission-connection to our partnerships. We brought on-board Dr. Alexander MacLachlan, the former Senior Vice President and Chief Technical Officer of Dupont, to be the Deputy Under Secretary for Technology Partnerships. Dr. MacLachlan has developed a criteria-based framework to ensure that our partnerships will:

-- Provide mission benefits as well as benefits to our partners;

-- Provide fair opportunities for companies;

-- Employ good business practices; and

-- Produce results that we can measure and evaluate.

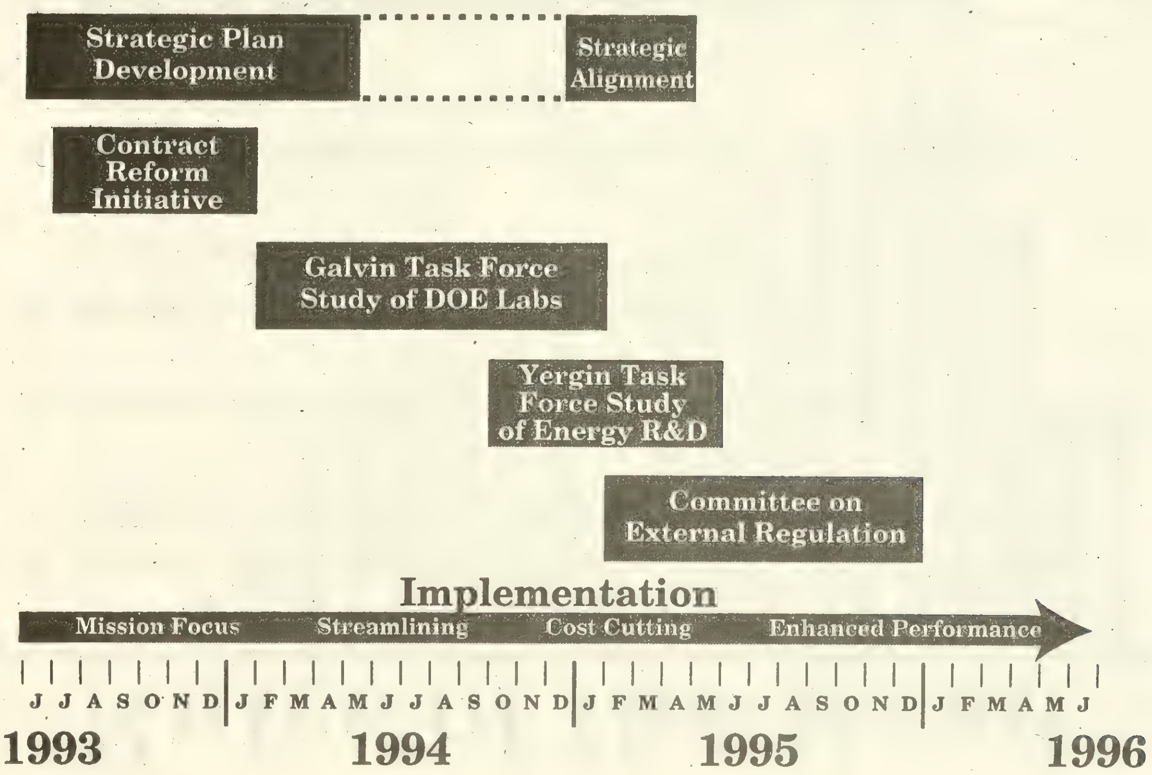
Conclusion

In closing, I would like to return to a point that I made at the outset. The Galvin Task Force was formed at our initiative, because we identified the need for independent, expert guidance about the future of the DOE National Laboratories. We wanted this study to be done, we are enthusiastic about its contents, and we are committed to using the report as an instrument to achieve a more productive laboratory system. The Department is grateful for the service which Bob Galvin and his Task Force members have provided to the nation. This report will make a difference. It already has. As a result of this examination, the National Laboratories have begun to work more like a system than ever before. This will lead to enhanced integration and rationalization of R&D across the DOE lab complex, and a more coordinated approach to addressing national scientific and technical challenges.

As we implement recommendations of the Galvin Task Force, along with the Management Improvement Roadmap discussed in this testimony, we will be able to take costs out of the laboratories. This will help them reach new levels of performance and productivity in addressing vital national needs. How much savings we will be able to achieve is difficult to predict. However, they should be significant. With a streamlined apparatus for managing the laboratories within the Department, the Laboratories will be required to restructure themselves into more efficient operations. These changes will not occur overnight, but, with your encouragement and support, they will happen.

Chairmen, Members of the Committee, the National Laboratories have a long record of achievement and excellence. Programs conducted at these laboratories have consistently challenged our basic understanding of the world around us and driven new fields of scientific inquiry, discovery, and technological development. These labs hold the potential to make considerable future contributions to the nation's security, environmental quality, knowledge base, prosperity, and quality of life. We look forward to working with you to create the management and programmatic framework that will guide these laboratories into the next century.

Creating A New Department of Energy



Strategic Plan Development

Strategic Alignment

Contract Reform Initiative

Galvin Task Force Study of DOE Labs

Yergin Task Force Study of Energy R&D

Committee on External Regulation

Implementation

Mission Focus

Streamlining

Cost Cutting

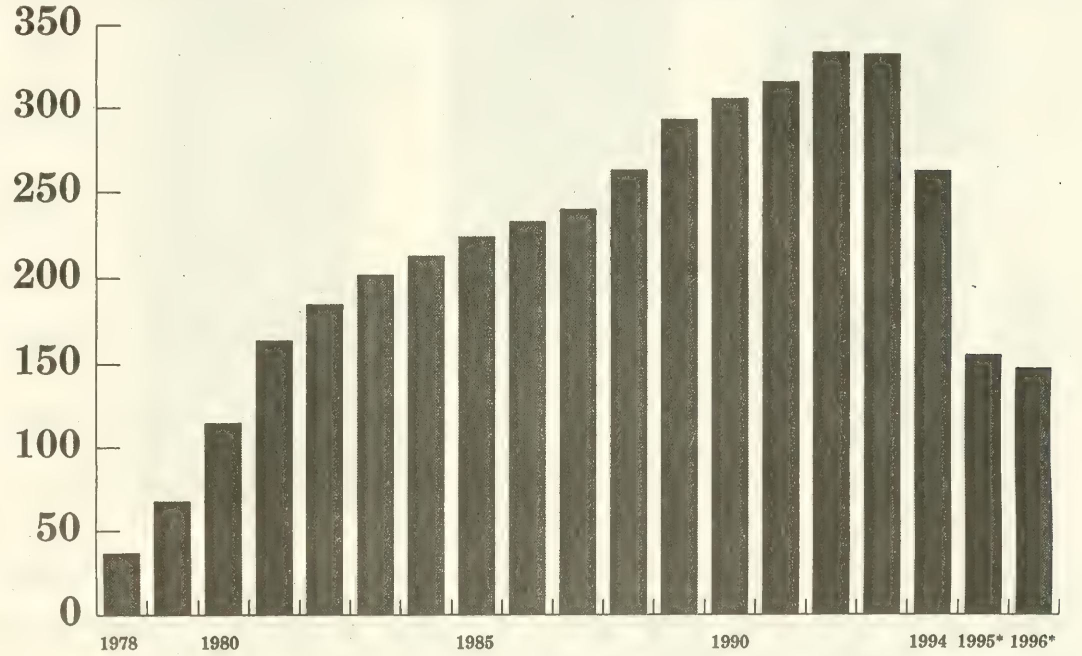
Enhanced Performance

Rules of the Road

1. Create a more productive, mission-focussed, and effective Department and laboratory system.
2. Adopt best business practices throughout the system.
3. Require performance-based, results-oriented contractor accountability.
4. Work aggressively to achieve credible, external regulation and oversight.
5. Shift the balance of focus away from process compliance and toward mission success and results.

Reforming DOE Directives:

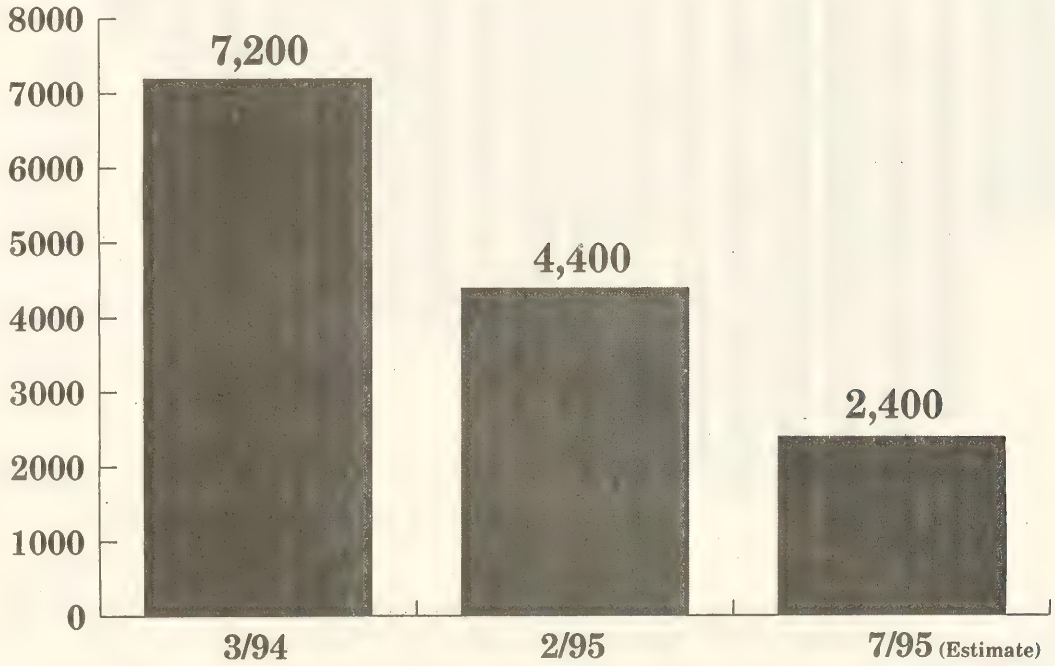
Number of Active Orders per Year



Numbers reflect Orders that were active at the end of each year.
* Estimate: Additional reductions are planned beyond 1996

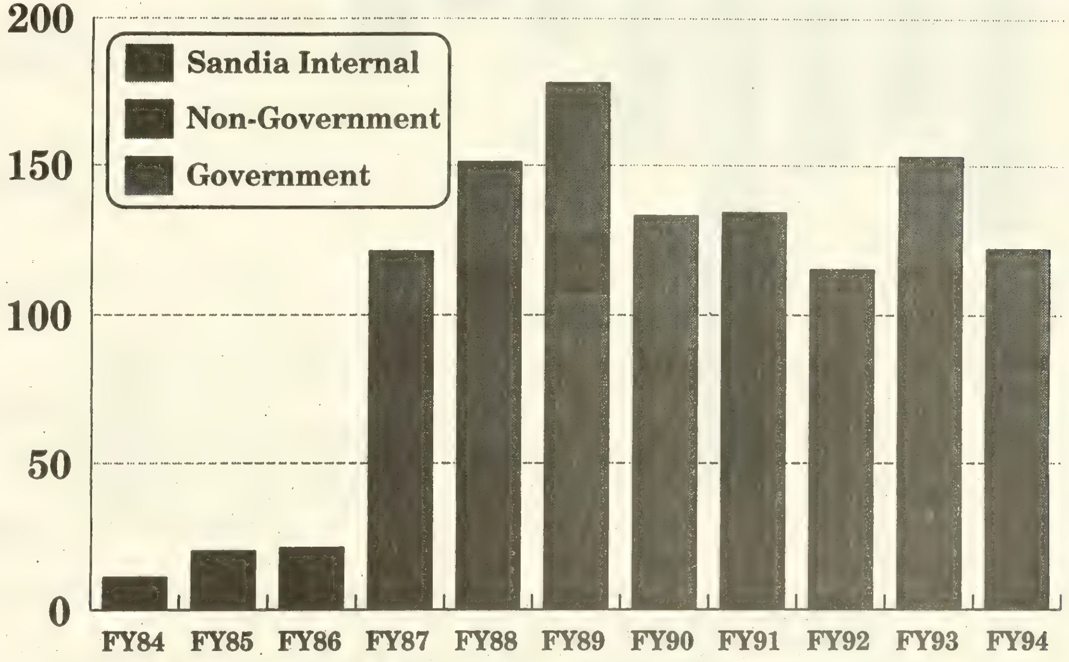
Reforming DOE Directives: Reducing the Burden

Directives Measured in Number of Pages



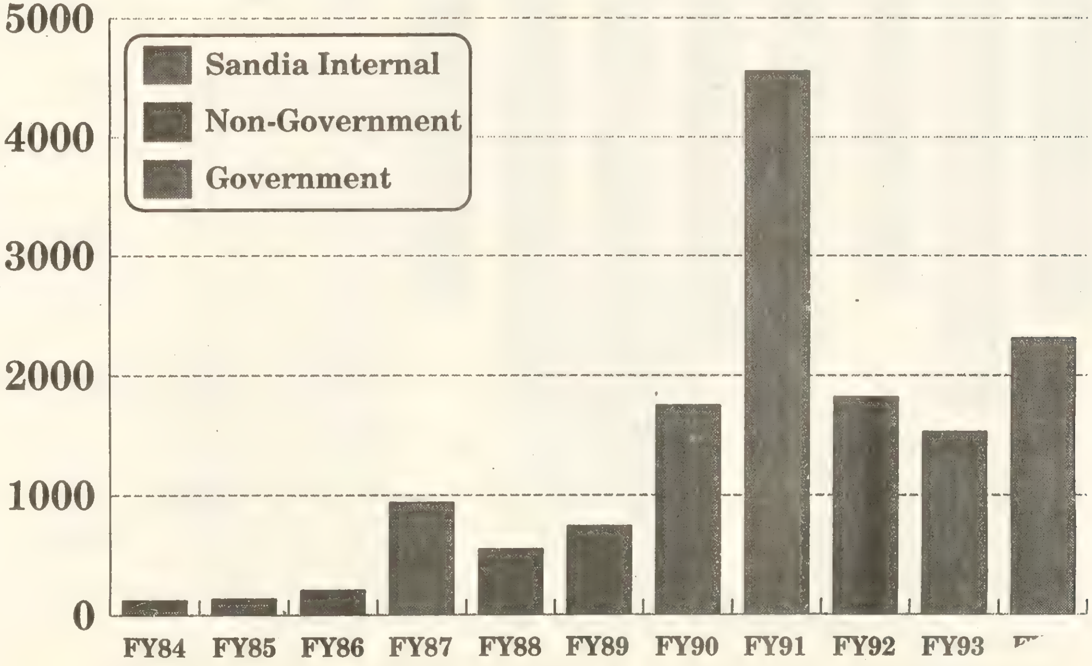
Sandia National Laboratories

Number of Audits & Appraisals



Sandia National

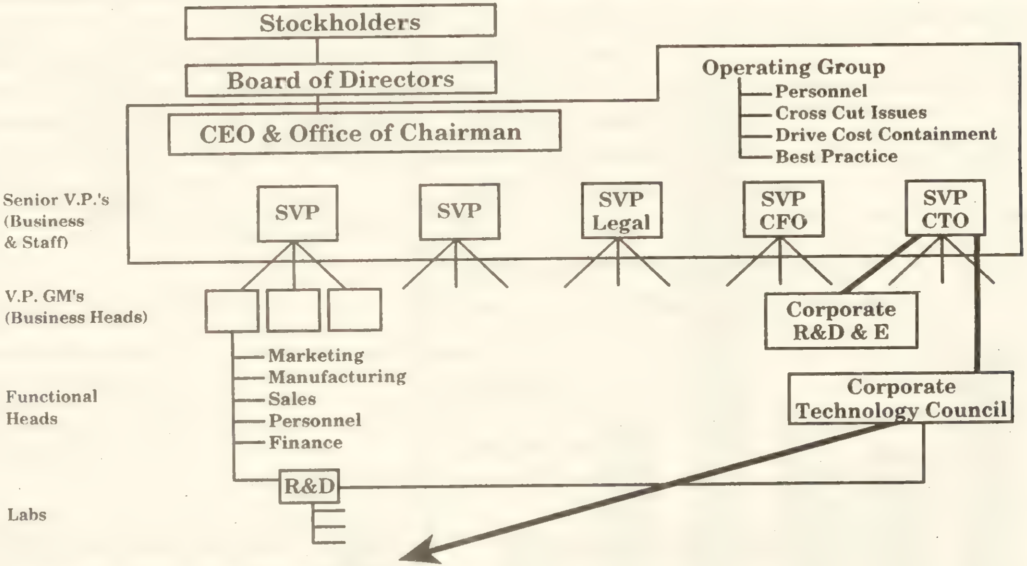
Audits & Appraisals by Person-Day



“Corporatizing” the Department of Energy

XYZ Corporation	Department of Energy
Stockholders	Taxpayers
Board of Directors	Congress
CEO & Office of Chairman	Secretary, Deputy, Under Secretary, Chief Financial Officer, etc.
Senior Vice Presidents	Senior Political Officials
Vice President / General Managers	Civil Servant Deputies
Business Division R&D Labs	National Labs
Corporate Technology Council	“Missing Link” (DOE Lab Operating Board?)

Structure of a Corporation



Corporate Technology Council Role
- Functional Personnel Development (Management & Professional)
- Indentify and Adopt R&D Management Best Practices
- Cost Containment
- Management of Corporate R&D & E Laboratory
- Facility Rationalization

GALVIN REPORT RECOMMENDATIONS
DOE POSITION, COMMITMENTS, AND DEADLINES

NATIONAL SECURITY	DOE POSITION	ACTION
1. *The primary mission of the weapons laboratories must be safe, secure and reliable nuclear stockpile in the absence of explosive testing. Science-based stockpile stewardship requires the following rank-order priorities:* *- Attracting and retaining skilled scientists,* *- Enhancing surveillance of weapons* *- Continuing hydrodynamic testing* *- Assessing problems, reanalyzing previous data* *- Sustaining the scientific process*	Support	**Commitment:** We will continue to evolve the science-based stockpile stewardship program, which the Task Force endorses, as the principle framework for the nuclear weapons-related mission of the weapons laboratories. During further refinement of missions for the DOE labs, the absence of nuclear testing will remain centrally important. Investments by the Department in world-class scientific programs such as the National Ignition Facility and the Los Alamos Neutron Scattering Facility (LANSCE) will help meet the high priority objective of attracting and retaining top level scientists and engineers. The Department's stockpile management program will provide enhanced surveillance. **Deadline**: 1) A document describing our overall Stockpile Stewardship & Management Strategy will be available by April 1, 1995; 2 A KD-1 Prime decision (Non-proliferation evaluation) on the NIF will be made July/August 1995; 3) The Phase I upgrade program to the LANSCE will be completed by July 1995; and 4) The Department plans to complete the Environmental Impact Statement on the Dual Axis Radiographic Hydro Test facility (DARHT) which will provide an advanced hydrodynamic testing capability by September 1995.
2. *Non-proliferation, counter-proliferation, verification, and intelligence support have become a major mission along with stewardship of the nuclear stockpile. Organizational compartmentalization within the Department complicates and makes difficult the appropriate inter-relationship and funding balance the Department's organization reflect their importance and interdependence.*	TBD	**Commitment:** Recommendation suggests that Office of Defense Programs and Office of Nonproliferation and National Security either be merged or that programmatic activities receive greater integration. These options are being examined in the Strategic Alignment. **Deadline:** Recommendation due May 4, 1995, which is when final Strategic Alignment report is due.

3. *Lawrence Livermore Laboratory should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter-proliferation, verification, and intelligence support, to provide independent review for several years while alternative approaches to peer review are developed, and to participate in weapons relevant experiments on the National Ignition Facility (NIF). Lawrence Livermore National Laboratory would transfer as cost-efficiency allows over the next five years its activities in nuclear materials development and production to the other design laboratory. Lawrence Livermore National Laboratory would transfer direct stockpile support to the other weapons laboratories as the requirements of science-based stockpile stewardship, support of the DoD nuclear posture, and the status of the test bans allow.*	Support, with qualifications	**Commitment**: The Department supports the study of a careful phase-down of some of Lawrence Livermore's nuclear weapons work, combined with a reemphasis on non-proliferation, counter-proliferation, and verification activities. Timing and details of phase-down will depend on assessment of how best to meet continuing national defense requirements in absence of testing. Alternative methods of retaining peer review will be examined to provide basis for any decisions. **Deadline**: Provide strategy for response to this recommendation by April 15, 1995.

4. *Continued funding support for the Dual-Axis Radiographic Hydrodynamic Testing (DARHT) facility; continued near-term support for the Los Alamos Neutron Scattering Experiment/Los Alamos Meson Physics Facility (LANSCE/LAMPF); continued pursuit of advanced computing, including computing through workstation networks; and proceeding with the National Ignition Facility (NIF) as a research facility, balanced with respect to other major investments.*	Support	**Commitment**: The Department will provide continued support for each of these elements of the science-based stockpile stewardship program. President's FY 1996 budget includes $32 million for DARHT, $25 million for LANSCE, $45 million for advanced strategic computing, and $61 million for design activities associated with the National Ignition Facility. **Deadline**: 1) A KD-1 Prime decision (Non-proliferation evaluation) on the NIF will be made July/August 1995; 2) Formal scoping process for the Stockpile Stewardship/Stockpile Management PEIS schedule to begin July 1995; 3) The Phase I upgrade program to the LANSCE will be completed by July 1995.
5. *Future production needs should be based on residual capabilities of Pantex, Los Alamos National Laboratory, and Sandia National Laboratories, and believes that no further investments in production capability are needed at this time.*	Oppose	**Commitment**: The Department is committed to ensuring the safety, security, and reliability of the existing U.S. stockpile well into the future, which will require a smaller, more cost-effective production complex to replace the stockpile when needed, including limited life components and a new tritium source. The President's FY 1996 budget includes $50 million to support a new tritium source. Existing production capabilities will be downsized, but production capabilities within the weapons laboratories maybe required. **Deadline**: The Stockpile Stewardship & Stockpile Management Program Plan which will analyze program and site alternatives for nuclear weapons production requirements between today and the year 2010 will be released October 31, 1995; followed by a draft PEIS and February/March 1996, and a final PEIS in July/August 1996. DOE released a draft PEIS on Tritium Recycle and Supply on March 1, 1995. Public hearings on the draft PEIS begin March 14 and conclude April 20. Final PEIS due October 1995. Record of Decision November 1995.

ENERGY AND ENVIRONMENT		
1. *The Department should organize itself to achieve greater integration among its applied energy programs, between these programs and industry, and between the applied energy and basic energy research work performed at the laboratories.*	Support	Commitment: The Department established in October 1994 the Task Force on Strategic Energy R&D, chaired by Daniel Yergin, in part to develop a plan that would assist in meeting the goals established by this recommendation. Deadline: Yergin Task Force report will be finalized in June 1995; the Department will work to implement its recommendations--particularly any that relate to enhanced integration of DOE energy R&D programs internally and with academia and industry--during summer 1995.

2. *The integration of energy and environmental considerations should be a fundamental organizing principle for much of the Department's activities.*	Support	**Commitment:** The Department is committed to sustaining and building on its partnerships with major energy- and materials-intensive industries, and to use these partnerships as an expanded framework for meeting the Task Force recommendation. Specifically, the Department has developed or is working on technology roadmaps for the forest products, refining, steel, glass, chemical, metal casting, and aluminum industries--which collectively account for more than 80 percent of the nation's manufacturing energy use and together generate approximately 90 percent of U.S. manufacturing waste. **Deadline:** Within three months, a plan will be developed cooperatively by the Office of Energy Efficiency, Office of Fossil Energy, and Office of Energy Research that examines options for using the existing framework of partnerships with energy- and materials-intensive industries as a basis for broader integration of energy and environmental considerations within the Department at the laboratories. The plan will be presented to the Lab Operating Board. In addition, by May 4, 1995, the Strategic Alignment will provide recommendations for achieving greater integration of energy and environmental activities within the Department.
LAB MISSIONS AND ORGANIZATION		
1. *The Department and the national laboratories should move promptly to establish clear mission statements for the laboratories which will be utilized as tools for budget decisions and long-term strategic planning.*	Support	**Commitment:** The Department, working with the Laboratories, will develop more tightly focussed mission allocations for the DOE Laboratories with the goal of building on areas of excellence, enhancing clarity of focus for each lab, and identifying areas for downsizing. The Laboratory Operating Board, which the Department will create in April 1995, will provide the framework for developing refined mission allocations to the labs **Deadline:** Interim Strategic Laboratory Mission Plan complete by July 1995, for consideration in context of FY1997 budget development; final Plan due December 1995.

2. *Mechanisms should be established to enhance the management of the multi-program laboratories as a system.*	Support	**Commitment:** Considerable progress has been made during past year in getting the National Laboratories to work together as a system. An immediate project of the DOE Laboratory Operating Board will be to work with the laboratories to identify and implement means of further integrating National Labs into a system. **Deadline:** Plan to be presented at first meeting of DOE Lab Operating Board, scheduled for week of April 24.
3. *The Department should establish lead laboratories according to mission assignments and programmatic strengths.*	Support	**Commitment:** Lead laboratory designations will be made, as appropriate, within the context of the Strategic Laboratory Mission Plan. **Deadline:** Framework for Lead Laboratories will be included in the Interim Strategic Laboratory Mission Plan, due in July 1995.
4. *The Department should establish Centers of Excellence within the laboratory system.*	Support	**Commitment:** Centers of Excellence will be established, as appropriate, in support of Lead Lab designations and the Strategic Laboratory Mission Plan. **Deadline:** Framework for Centers of Excellence will be included in the Strategic Laboratory Mission Plan, due in interim form in July 1995.

WEAPONS SITE CLEAN-UP		
1. *Improvements in DOE management are needed.*	Task Force Failed to learn current program status	**Commitment:** The Task Force seems to be unaware of the substantial progress the Department has already made in improving the management capabilities in the environmental management program at all levels. The Task Force had minimal direct interaction with the program, and appears to have relied too heavily on outdated reports. The Department has significantly increased management capability by hiring and training competent project managers, cost estimators and contract coordinators. This new management capability has already resulted in a savings of more than $500 million in the Environmental Management program. Also, the Quality Improvement Team concept (QIT) has afforded the Department continuous improvement in its managerial enterprises. **Deadline**: Continuous improvement in management capabilities will be an ongoing priority for the Environmental Management program.
2. *The EM program requires a substantial commitment and high priority addressing the challenges of this program.*	Support/completed	**Commitment:** It is unclear why the Task Force suggests that the Department has not made a "substantial commitment" or made environmental management a "high priority." With an annual budget of more than $6 billion, Environmental Management is the largest environmental program in the world, and, as of FY 1994, it is the largest program in the Department of Energy. The level of commitment and priority necessary for this program will be maintained. **Deadline**: NA

3. *Establish an Environmental Advisory Board EAB reporting to the Under Secretary.*	Completed	**Commitment**: The Department already has established several advisory boards and independent reviews to service the Environmental Management program. Our challenge is not to create more advisory boards, but to use the ones that exist more effectively. We commit to continued utilization of: (1) an existing Environmental Management Advisory Board (EMAB), (2) two ongoing studies by panels of the National Academy of Sciences, (3) the Development of On-site Innovative Technologies (DOIT) Committees, and (4) Site Specific Advisory Boards that exist at every major cleanup site. The EMAB, of which the Task Force apparently was unaware, was established in 1990 to help guide policy. The Board has 28 members representing a wide range of organizational perspectives and fields of expertise, including the National Laboratories. EMAB subcommittees exist to address key issues, including risk management, cost-effective cleanup, and technology development and transfer. **Deadline**: NA
4. *The national laboratories should play a larger role than at present in ... the Environmental Management program.*	Support, with qualifications.	**Commitment**: The Department will continue to provide strong support to the National Laboratories for environmental clean-up technology development. In FY1995, DOE laboratories will receive $150 million (45%) of the Environmental Management program's $336 million technology development effort. Lead labs recently have been established for the major Environmental Management Technology Development Focus areas, as recommended in the Task Force report. Cost and performance of the DOE labs vis-a-vis other R&D performers will provide the basis for decisions regarding future funding allocations. Efforts to reduce the cost of business at the National Laboratories should enhance their competitive position for funding increases in this and other areas of R&D. **Deadline**: Role of the labs in the Environmental Management Technology Development program will be examined during summer 1995, in conjunction with FY 1997 budget development.

5. *The national laboratories should be available to the entire government system as a powerful environmental technology resource.*	Support	**Commitment**: The Department strongly agrees with this recommendation and will continue to work with other Government agencies to help facilitate enhanced utilization of the Laboratories in areas where laboratories' technology capabilities might help provide cost-effective R&D solutions. The Department and/or DOE laboratories currently have Memorandums of Understanding with other Executive Branch entities including: the Department of Defense, Department of Health and Human Services, National Institute for Standards and Technology, Environmental Protection Agency, Department of Agriculture, and Department of Transportation. These agreements help provide the framework for making the National Laboratories available as a national resource. The Department will work aggressively with other agencies to match laboratory capabilities with national R&D needs. **Deadline**: Comprehensive report on work for other agencies performed by the National Laboratories will be presented to the Lab Operating Board, summer 1995, with plan for making labs more available as a national resource.
6. *DOE must address more forcefully the task of renegotiating the unrealistic or unfeasible elements of the cleanup compliance agreements that it has made with State and Federal agencies.*	Support	**Commitment**: Budget realities are forcing the Department to continue its renegotiation of many existing compliance agreements, thus creating a more workable, affordable, and results-oriented compliance regime. Considerable progress already has been made, including the 1993 renegotiation of the Hanford agreement at a savings of more than a billion dollars, and renegotiation of dozens of smaller agreement throughout the country. The Department is committed to making structural changes to our compliance agreements to provide the necessary flexibility because of shifting site conditions and budget realities. For example, we are seeking to replace elaborate long-term enforceable schedules with enforceable shorter-term schedules with greater emphasis on results-oriented milestones rather than process milestones. **Deadline**: Restructured program, involving $4.4 billion cost reductions over five years, will be put in place during 1995.

7. *Much more comprehensive involvement by members of the affected public in decision making should be employed to reduce the bitterness, distrust and distress that continues to provide a troublesome element in DOE's conduct of affairs.*	Support/Partially Completed	**Commitment**: The Department agrees that public and stakeholder involvement is vital, and has already taken a number of major actions to accomplish this goal. For example, in the Environmental Management program, the Assistant Secretary established the Office of Public Accountability. Other initiatives include the expansion of the Environmental Management Advisory Board, the formation of numerous Site Specific Advisory Boards (SSABs) at many DOE sites, and a technology development program that incorporates public input. Since 1993, "Establishing a stronger partnership between the Department of Energy and it Stakeholders" has been one of the six strategic goals of the Environmental Management program. Independent surveys have demonstrated significant improvements in the public's trust and confidence in the Department. **Deadline**: Public involvement is being structured into the Environmental Management Program on a continuous basis.
8. *The bulk of EM environmental challenges, although presenting no immediate threats to public health or safety, still should be addressed with a heightened sense of urgency.*	Completed, within budget limits	**Commitment**: Although the Department generally agrees with this statement, limited resources will ultimately determine the pace at which these risks can be addressed. Hence, the Environmental Management program's first strategic priority is to "Eliminate and manage the urgent risks in the system." This goal reflects the reality of limited resources available to the Environmental Management program. Some actions must be deferred where there is no near-term urgent risk, and to invest in new technologies that will reduce the cost and increase the effectiveness of a more sustainable remedy. This strategy recognizes the need to focus available funding on existing urgent risks and to identify emerging risks, while developing productive and cost-effective technologies for the long-term success of the program. **Deadline**: Established by management plans and vulnerability studies at each site.

SCIENCE-ENGINEERING		
1. *The Department of Energy should move to strengthen its efforts in fundamental science and engineering, both at the laboratories and in the universities.*	Support	**Commitment**: The Department has taken two important actions in its FY 1996 budget request to strengthen efforts in fundamental science at the labs and universities: 1) In high energy physics, DOE has responded to the Drell report to revitalize the program in the wake of the termination of the Superconducting Super Collider (SSC). Increased funding will provide additional support for university groups that were funded directly by either the Federal Government or the State of Texas through the SSC project. In addition, it will provide some initial funding to allow both universities and the Department's high energy physics laboratories to explore possible areas of collaboration in the Large Hadron Collider to be built at CERN, and 2) The $100 million Science Facilities Initiative will provide about a 30% increase in output of basic science from the Department's scientific user facilities,benefiting several thousand researchers in universities, the national laboratories and industry. We will assign the Laboratory Operating Board with the task of monitoring the Department's investments in fundamental research. **Deadline**: FY 1996 implementation of Drell Report recommendations and Science Facilities Initiative.
2. *The DOE should pay close attention to ensuring that a proper balance is maintained between the universities and the national laboratories in the performance of DOE related basic research, both now and in the future.*	Support	**Commitment**: During the next year, the Department will request its science advisory committees to examine the balance between university and laboratory research programs in those instances where this has not been done recently. **Deadline**: Review should be complete in all major categories of DOE science funding during 1995, and presented to the Lab Operating Board.

3. *Support for operating and maintaining large facilities in the DOE's Office of Energy Research should be budgeted separately from funds for specific programs.*	Oppose	**Commitment**: The Department does not believe that the recommendation would provide significant benefits, and could greatly reduce management's flexibility to respond to unexpected needs in either research or facility operations funding. Research and facilities are not unrelated in the sense that a considerable amount of funded research depends on operation of facilities. For example, a facility could require extensive, unexpected repair, but would not have sufficient funds in a separate facilities account. Without the ability to quickly move funds to fix such a problem, a considerable number of scientists and their research in universities and industry as well as the national laboratories could be adversely affected causing considerable losses in productivity. Conversely, there might be a need in a research program that could be best met by moving facilities operating funds to support the research. **Deadline**: NA
4. *The DOE should redouble its efforts to achieve better integration of basic research, technology development programs, and their applications, particularly in the area of environmental remediation.*	Support	**Commitment**: The Department is committed to fostering the timely transition of research results from fundamental discovery to functional application. There already exists considerable interaction between the Department's basic and applied research programs. One of the most effective means of integration is through the collocation of basic and applied research. While there are many integration activities already underway, we agree with the Galvin report recommendation that improvement is necessary. There is an urgent need to better integrate research related to environmental management. In that regard, we will establish a Research and Development Council at the Assistant Secretary/Deputy Assistant Secretary level, reporting to the Under Secretary, to ensure high level support for integration of basic and applied research programs. This Council would provide policy guidance for various integration activities, e.g., development of technology road maps for the applied programs that require advances in basic research. More specifically, the Office of Energy Research and Office Environmental Management will develop an integrated strategic plan for coordination for R&D. Workshops involving the scientific community (including representatives from the labs) and environmental cleanup experts will facilitate development of this plan. **Deadline**: The Council will be established by the end of May 1995.

5. *Basic Research at the laboratories should be more fully integrated into the national and international research community.*	Support	**Commitment**: The Department agrees with this recommendation. However, implementation will vary from one field of research to another. Research in the fields of high energy physics, nuclear physics, fusion energy, human genome, and global climate change already are tightly integrated nationally and internationally. Several interagency and international agreements ensure this integration. The Department will undertake a broad examination of this issue using its advisory committees and will seek their recommendations to better integrate research activities not captured by existing frameworks between the labs and other R&D performers. The Science Facilities Initiative will help foster additional interrelationships between the labs, industry, and academia. **Deadline**: Review complete by end of December 1995.
6. *There should be additional stimulation of laboratory-university cooperation in basic research.*	Support	**Commitment**: Existing laboratory-university relationships are very good in some areas, but not as strong as they might be elsewhere. These interactions are particularly strong at the scientific user facilities. In addition, there exist many very strong cooperative research activities between the laboratories and universities. Intellectual renewal is facilitated through cooperation between the laboratories and universities. To enhance the level of interaction, the Department will, as a matter of policy, encourage and reward its laboratories for establishing cooperative research programs with universities and consortia, especially for Centers of Excellence with universities and industry as partners in laboratory basic research. In addition, we will implement improved means for remote access to DOE user facilities as a means of achieving enhanced integration of the laboratories into the national R&D infrastructure. **Deadline**: Policy guidance aimed at further encouraging cooperative research between the Labs and universities will be issued by the Secretary by June 15, 1995; pilot projects in remote access of DOE user facilities will be established during calendar 1996, beginning with the Advanced Photon Source.

ECONOMIC ROLE OF THE LABS		
1. *The government-funded technology transfer/industrial competitiveness activities of the national laboratories should be focused on industries and areas of technology that contribute to the DOE's primary missions in national security, energy and environment.*	Support	Commitment: The recommendation will be fully implemented by the imminent issuance of criteria for partnership formation. The criteria, which have been in prepartation for months, require all partnerships to: 1) Support core missions; 2) provide economic and other benefits to the nation; 3) have clear measures to ensure performance and accountability; 4) be formed in a fair and open manner; and 5) be managed by best business practices. Deadline: Criteria will be issued by March 31, 1995, for immediate implementation, and their use will be reviewed within six months.
2. *Laboratory directors should have the flexibility to initiate or to approve new technical projects at the periphery of current laboratory activities.*	Support	Commitment: The Department will examine and clarify guidance on the appropriate use of laboratory directed research and development. Laboratory directors currently have discretionary funds that they may use to initiate new technical projects at the periphery of current missions. Laboratories are allowed by statute to use these for industrial partnerships. Deadline: Guidance clarified by March 31.
3. *Competitive selection and more rigorous technical and merit review by external experts should be applied within the Department's CRADA activities.*	Support, with qualifications	Commitment: The Department will examine its existing CRADA review and selection process to seek opportunities to expand competitive selection and technical and merit review by external experts. The Department is committed to a rigorous, criteria based, CRADA selection process. We believe that competitve selection and external peer review is appropriate for some but not all classes of CRADAs. For small CRADAs, for example, the benefits from external review may not be worth the cost and time to conduct the review. Similarly, when a potential partner comes to us with a propriety problem and proposes a cooperative research program that is in the Department's interest, it may not be appropriate to require competitive selection. Deadline: Review complete by June 1, 1995.

GOVERNANCE		
1. *Over a period of two years, the Department and Congress should develop and implement a new modus operandi of Federal support for the national laboratories based on a private sector style - "corporatized" - laboratory system.*	Oppose as delineated; support in modified form	**Commitment**: The Department supports development of a new modus operandi for the National Laboratories, but believes the goals established by the Galvin Report can be accomplished within the existing Government-Owned, Contractor-Operated model. We are committed to achieving these goals through implementation of the Management Improvement Roadmap which has been described elsewhere. This approach addresses issues raised in Appendix B of the Task Force Report. A Lab Operating Board will be established to achieve enhanced performance and efficiency of the National Laboratories. **Deadline**: Establish Lab Operating Board by March 31, 1995; implement each element of Management Improvement Roadmap (deadlines also listed at beginning of this chapter): 1) New Rules of the Road for Lab Management immediately; 2) Reform/Reduce Directives: 50% reduction in DOE orders by December 31, 1995; 26 most burdensome orders reissued by July 31, 1995; implementation of five "necessary and sufficient" pilot projects Fall 1995; 3) Report from Advisory Committee on External Regulation by December 1995; 4) Reform Audits/Appraisals through immediate moratorium of business practice reviews and revision of audit system; 5) Procurement reform through rulemaking that eliminates "federal norm;" final rule by summer 1995.

Mr. SCHIFF. Thank you, Secretary O'Leary. It's always a pleasure to have you with us.

I want to first thank Congressman Dana Rohrabacher, Chairman of the Energy Research Subcommittee, for agreeing for this joint hearing, so that we could consolidate our time, as both Subcommittees are interested in this subject.

I'd like to acknowledge that we've been joined by the Chairman of the Science Committee, Congressman Robert Walker of Pennsylvania.

I'd like to recognize Congressman Walker. I'm sorry, Congressman Rohrabacher, did you desire—Well, I recognized Mr. Brown earlier. Thank you.

Congressman Rohrabacher indicated he would waive an opening statement also. Congressman Walker, do you desire to be recognized for an opening statement?

Mr. WALKER. No.

Mr. SCHIFF. Congressman Walker waives that request.

Let me say with respect to questions, which I would like to go to now once again, that because this panel has asked to be released and I have guaranteed that they'll be released at 11:00 a.m., that first we will adhere strictly to the five-minute rule.

Given the number of members here, not all members may get a chance to ask this panel questions.

I want to ask Mr. Galvin and Secretary O'Leary if members who don't have an opportunity to ask questions directly submit them in writing to me, may I submit them to you for your consideration and response?

Secretary O'LEARY. Absolutely.

Mr. SCHIFF. I appreciate that very much. Second, with my own Subcommittee, I have the question order a little different. Here I think it's best to go on seniority as we are seated, because I think it's too much to ask the staff to keep track of two Subcommittees' members comings and goings. So we'll ask questions in the order that you see us all seated at the moment.

Secretary O'Leary, I would like to address a question to you. This is on a subject which just arose in the last couple of weeks. I hope you've had time to study with your staff, and it deals with Kirtland Air Force Base, which is in New Mexico, and the proposal of the Air Force to the BRAC Commission to realign—that's the word that's used—the realignment is so significant in this particular case, it is the next thing to closing. They essentially desire to almost withdraw the Air Force presence, certainly the support presence, completely.

In fact, I thought you might be interested in a headline that appeared in the Albuquerque Journal. This is dated March 4th. It says "Kirtland Cuts Leave—DOE Leary."

[Laughter.]

Mr. SCHIFF. I think they spelled your name wrong on this, but I'll see that you get a copy.

What I want to ask you very, very seriously, as you well know, within the State of New Mexico, there has been an intense involvement in our nuclear deterrents mission, all the way back to the Manhattan Project. It continues today.

Particularly involved with our National Laboratories, Los Alamos and Sandia, the Galvin Commission report, as I understand it, urges a further concentration of our nuclear deterrent work in the National Laboratories in New Mexico, including the possibility of production, if that becomes necessary in the future.

At the same time, the United States Air Force is recommending essentially the demilitarization of Kirtland Air Force Base which, again, as you know, Sandia National Laboratories and the Department of Energy's Albuquerque field office are both tenants on Kirtland Air Force Base.

And I would like to ask, as the Secretary of Energy, do you have any reaction and a position on the Air Force's recommendation, with respect to realignment of Kirtland Air Force Base?

Secretary O'LEARY. I do, Mr. Chairman. My reaction stems, first of all, from relatively short term involvement in the problem, because it was not until late in the week before the announcement that we understood that Kirtland was on the list.

So I tended to look at this in the short term, while since working with our colleagues in the Air Force, I might want to point out very quickly have been concerned about several things.

It would come quickly to mind, the first would be cost. As tenants of the Air Force, we pay a fee of $18 million yearly for occupying the space and for the provision of services that the government and its laboratories receives from the Air Force.

Now, I need to move into the area of what I think will be some cost, not only cost, but now management time and attention given to now being in charge of our own lives at that site, should these recommendations play out.

The first of which is to tell you that our calculations on the cost are very premature, and we look forward next week to our colleagues at the Department of Defense arriving at the base, and we will begin to engage in a much more pragmatic way of trying to understand the costs to the Department and, therefore, to the American taxpayer.

What we know at the moment, and I point out that this is very sketchy, on simply infrastructure improvements that we must now take over to be in charge of ourselves, we have a preliminary figure of a cost of $18 million. With respect to what would be the cost annually to now become the managers of our own land, we have again a very back-of-the-envelope figure, which equates to about $40 to $50 million.

The things that you need to know are the areas that are of greatest concern to us. The first would be security. The Department and Sandia will have to reevaluate our current parameter security and now come up with a new design understanding, if this probability takes place.

The other areas concern our emergency response, both with respect to personnel and equipment. It's a job that the Air Force has done for us.

Infrastructure I've alluded to, but there is a great need for upgrades, just as is the case with all of our laboratories, now upgrades of facilities for which we would have looked to the Air Force.

There are a number of land issues which impact not only the Department of Energy, but impact the citizens living nearby Sandia.

As we all recognize that the land availability in the area is very low, and now we must open up the question to what is the best uses of this land.

The Department of Energy will play greatly in those details, but we're clear that this will renew the public's interest in the whole question of land use on that site.

Again, I want to leave you with the impression that the cost impacts that I've cited to you are very preliminary. In the three weeks that the Defense Department and the Department of Energy and our laboratories and our contractors will be working together, we will further refine those costs and perhaps more importantly, better understand the impacts. And I would be happy to share them with this Committee. We take this very seriously.

[The material referred to follows:]

COMMITTEE: HOUSE COMMITTEE ON SCIENCE
SUBCOMMITTEES: BASIC RESEARCH
ENERGY AND ENVIRONMENT
WITNESS: SECRETARY O'LEARY
PAGE: 36
LINES: 807

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Over the past 2-3 weeks, Department of Energy and Sandia National Laboratory field personnel have been working to refine the cost impacts related to the Kirtland Air Force Base realignment. The Department of Energy and Sandia National Laboratories, as major tenants on the Kirtland Air Force Base, are dependent on the Air Force to provide safety, security, and infrastructure support on the Kirtland Air Force Base. These services include security, fire protection, and emergency operations as well as maintenance and operations of roads, utilities, traffic control, and grounds maintenance. The organizations that currently provide those services are proposed to be either relocated to other bases or to be dissolved. This will result in the Department of Energy and Sandia National Laboratories having to assume many of these responsibilities to continue our program. Since that announcement, we have been analyzing the cost and operational impacts of the potential realignment on the Department's operations at the base.

If the proposed realignment is approved, it appears that the Department of Energy and the Sandia National Laboratories would need to establish an operations, safety, and security zone, which comprises a large percentage of the land currently encompassed by the base. With this responsibility would come a requirement for additional funding. We estimate that it would cost the

Department of Energy an additional $65 million of one-time costs to acquire or carry through with the Air Force planned capability enhancements needed to continue the current Department of Energy operation on Kirtland Air Force Base. In addition, about $30 million would be required on an annual basis to maintain and continue these operations. We estimate that the cost to the Department of Energy over the next 20 years, expressed in net present value terms, could be about $440 million. While we are continuing to review our estimates, we are confident these are generally correct. These estimates do not include the capabilities necessary to support the other remaining tenants on the base. We believe the other tenants, both large and small, would be impacted by the Kirtland realignment and would have cost impacts of their own.

In addition to funding issues, we are also concerned about the loss of synergy caused by breaking up nuclear weapons interface activities between the Air Force, the Defense Nuclear Agency, the Department of Energy, and the Sandia National Laboratories. Many activities such as the Department of Energy's Accident Response Group are deployed from Kirtland Air Force Base. This group, which is comprised of the Department of Energy, the Los Alamos National Laboratory, the Sandia National Laboratories, and other Department of Energy organizations, is responsible for responding to any accident involving a nuclear weapon anywhere in the world. None of these problems are insurmountable. However, they are of concern to the Department of Energy and could be expected to result in the unnecessary commitment of resources, which would not be needed under the current base alignment.

Still another concern centers around the Kirtland Underground Munitions Storage Complex. As presently envisioned, this facility would be located in the Department of Energy/Sandia National Laboratories cantonment. With a reduced Air Force presence on the base, it would be uncertain that the Air Force can maintain this facility for the long-term.

The eastern portion of Kirtland Air Force Base is an area which is currently used by the Department of Energy, the Sandia National Laboratories, and the Air Force Phillips Laboratory for critical program purposes. Use of that land and facilities would not likely change with the reduced Air Force presence. This area has significant hazardous activities that would preclude increased public access to those areas. These hazards include unexploded ordnance, live fire ranges, physics experiments, and areas requiring environmental remediation.

investment which amounts to about 47 percent of the share of the work we're doing.

And in these tight budget times, what should we stop doing?

That is the work of the Yergin Task Force. In that area, I'm committed to find $1.2 billion worth of savings over the next five years.

The final piece of it at the bottom is the Committee on External Regulation, which has to do with the regulating of our nuclear facilities and its safety and its environmental work.

That Task Force was formed today. The President, rightfully I think, decidedly wanted an independent Task Force. It met today. I've asked them to report to me by the end of this year. That's a very quick timetable, a bit faster than the Galvin Commission which did it in one day short of a year, but they said they'd deliver in a year, and they did beat it.

And I believe that is important to engage the work that's now going on in the Congress, because our fault has been that we have self-regulated and we've laid in a very arcane and much too complex system to do that.

There are some who believe that that is best done outside of the Department of Energy. You need to know that most of the work that the Department does has never been regulated externally, so this is work of a first impression.

I've assembled a group of very informed individuals, whose resumes I will leave with you today in that press release.

The final piece up at the top, which is attached to a strategic plan development, is a strategic alignment of the Department of Energy whose work will be completed in its recommendation phase by the end of April, I would think about the 30th of April.

That is the opportunity to let us get at the multilayers, the many organizational structures belonging to the Department of Energy who oversee and may, of necessity, be performing non-value added work.

On that exercise, I expect to find about $1.4 or $1.5 billion worth of savings over five years. That is a commitment that I've made to the President, and I make it to the Congress.

So in sum, all of these initiatives, which were begun almost the day I arrived, will permit us, as a Department of Energy, to run the place more like a business. And I'm clearly recognizing, having come from the business community, that we'll never be completely like a business but we can do it better, and I'm committed to do so.

We've already recognized great savings. We can and are committed to do better.

Mr. GEREN. Thank you.

Committee:	House and Science
Subcommittee:	Subcommittee on Basic Research and Energy and Energy and Environment regarding the Galvin Report
Hearing Date:	March 9, 1995
Witness:	Secretary O'Leary
Page:	52
Line:	1200

Inserts for the Record

Attached is the press release for the Advisory Committee on External Regulation, which includes the names and affiliations of the members of the Committee.

DOE NEWS

NEWS MEDIA CONTACT:
Anne Elliott, 202/586-1607

FOR IMMEDIATE RELEASE
February 16, 1995

ENERGY DEPARTMENT ADVISORY COMMITTEE WILL EXAMINE OPTIONS FOR IMPROVING NUCLEAR SAFETY OVERSIGHT

Secretary of Energy Hazel R. O'Leary and Under Secretary Charles Curtis today announced the formation of a federal Advisory Committee on External Regulation of Department of Energy (DOE) Nuclear Safety. The panel will recommend how existing and new DOE facilities and operations should best be overseen to protect environment, safety and health, eliminate unnecessary oversight, and reduce costs.

The committee's charter responds to a growing sentiment within the Department, at DOE facilities, and by external observers that DOE self-regulation is cumbersome and inefficient, and that external regulation could improve safety and cut costs. Work of the Committee follows on the recently released Galvin Task Force Report on the DOE Laboratories, which concluded that the Department should shift laboratory oversight and inspection functions to other federal agencies.

A transition to external regulation was also embraced during a meeting this week, chaired by Under Secretary Curtis, of the Directors of DOE's major laboratories, and senior DOE officials.

Dr. John F. Ahearne and Mr. Gerard F. Scannell will serve as the committee's co-chairs. Secretary O'Leary remarked, "I can't imagine two more qualified people to guide this important effort." Dr. Ahearne is the Executive Director, Sigma Xi, The Scientific Research Society; and past Chairman, Nuclear Regulatory Commission and the DOE Advisory Committee on Nuclear Facility Safety. Mr. Scannell is President, National Safety Council; former Assistant Secretary for Occupational Safety and Health in the Bush Administration; and former Vice President, Corporate Safety Affairs, Johnson & Johnson. The advisory committee staff, whose members are from the Department of Energy, the Environmental Protection Agency and the Nuclear Regulatory Commission, has been assembled under Executive Director Thomas H. Isaacs, a senior career DOE official.

(MORE)

R-95-013

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In announcing the committee, Under Secretary Curtis said, "This eminent committee will help the Department move aggressively toward external regulation -- a key commitment in our 1994 Strategic Plan and an important step in advancing the Department's critical missions". The advisory committee's formation fulfills a commitment made last year by Under Secretary Curtis before the House Subcommittee on Energy and Mineral Resources, during a hearing on a bill to subject the department to Nuclear Regulatory Commission regulation.

Secretary O'Leary emphasized, "The advisory committee is a major step in the department's continuing efforts to increase program productivity and save taxpayer dollars. The department is dedicated to achieving unquestioned environmental, safety and health protection in all of its activities. At the same time, we need a regulatory framework that is more effective and less expensive."

Over the past half century, the department and its predecessor agencies have regulated themselves with regard to nuclear safety, as provided for under the Atomic Energy Act. The manner of oversight established in the Act reflected the agency's primary responsibilities for development and production of nuclear materials and weapons, and for many other classified national security activities appropriate in a Cold War environment. Production was of highest priority during those times, and the results include a legacy of safety and environmental problems at numerous DOE sites.

The nuclear mission of the department has changed and is now focused largely on the stewardship and dismantlement of nuclear weapons, cleanup of contaminated sites, safe decommissioning of facilities, and minimization of risks to workers and the public. In addition, in recent years the department has become subject to an increasing number of external federal and state regulatory requirements and oversight, while at the same time internal requirements and oversight have intensified. The department also now receives advice from the Defense Nuclear Facilities Safety Board, established by Congress in 1988 to make recommendations regarding safety at DOE defense nuclear facilities. According to O'Leary, "This patchwork of regulatory requirements and oversight must be rethought. This committee is essential to developing a smarter approach." Regulatory options will be examined which weigh costs against projected benefits in safety, health, and environmental protection.

Secretary O'Leary also emphasized, "We are not talking about additional regulation. Quite the opposite. The committee will examine how to streamline and focus safety oversight. I look forward to receiving the committee's recommendations later this year."

The committee will be asked to submit an interim report to the Secretary and simultaneously to the White House, Office of Management and Budget, and Council on Environmental Quality within six months and provide final recommendations by the end of the year.

A complete roster of advisory committee members is attached.

- DOE -

R-95-013

MEMBERS OF ADVISORY COMMITTEE ON EXTERNAL REGULATION OF DEPARTMENT OF ENERGY NUCLEAR SAFETY

Dr. John F. Ahearne, Co-chair; Executive Director, Sigma Xi, The Scientific Research Society and Adjunct Scholar, Resources for the Future, North Carolina (Former Chairman, U.S. Nuclear Regulatory Commission and DOE Advisory Committee on Nuclear Facility Safety)
Gerard F. Scannell, Co-Chair; President, National Safety Council, Itasca, Illinois (Former Assistant Secretary of Labor for Occupational Safety and Health Administration and Former Vice President, Corporate Safety Affairs, Johnson and Johnson)

Andrew D. Caputo, Attorney, Nuclear Program, Natural Resources Defense Council, Washington, D.C.
Joseph A. Dear, Assistant Secretary for Occupational Safety and Health, Department of Labor, Washington, D.C.
Victor A. Franklin, Chief Environmental Counsel, Westinghouse, Pittsburgh, Pennsylvania
Beverly E. C. Gattis, Serious Texans Against Nuclear Dumping, Amarillo, Texas
T. J. Glauthier, Program Associate Director for Natural Resources, Energy and Science, Office of Management and Budget, Washington, D.C.
Sheri W. Goodman, Deputy Under Secretary of Defense for Environmental Security, Washington, D.C.
Dr. Andrew C. Kadak, President and Chief Executive Officer, Yankee Atomic Electric Company
Sylvia M. Kieding (Krekel), Health and Safety Coordinator, Oil, Chemical and Atomic Workers International Union, Lakewood, California
Mathew Leivas, Sr., Chairman and Chief Executive Office, Chemhuevi Tribe, Havasu Lake, California
Dr. Walter E. Massey, Provost and Senior Vice President Academic Affairs, University of California, Berkeley, California
Dr. Mildred McClain, Executive Director, Citizens for Environmental Justice, Savannah, Georgia
Dr. James Melius, Scientific and Medical Director, Center to Protect Workers' Rights, AFL-CIO, Washington, D.C.
Michael H. Mobley, Director, Department of Environment and Conservation, Division of Radiological Health, Nashville, Tennessee and Council of Radiation Control Program Directors
Dr. Thomas E. Murley, Consultant, Former Director, Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Potomac, Maryland
Robert H. Neill, Director, Environmental Evaluation Group, Albuquerque, New Mexico
Mary D. Nichols, Assistant Administrator for Air and Radiation, U.S. Environmental Protection Agency, Washington, D.C.
Dr. Tara O'Toole, Assistant Secretary for Environment, Safety and Health, Department of Energy, Washington, D.C.
Jim Payne, Assistant Attorney General, Environmental Enforcement Section, Office of the Attorney General, Columbus, Ohio and National Association of Attorneys General
Stephen D. Ramsey, Vice President, Corporate Environmental Programs, General Electric Company, Fairfield, Connecticut
Gail Schoettler, Lieutenant Governor, State of Colorado
Bruce G. Twining, Manager, Albuquerque Operations Office, DOE, Albuquerque, New Mexico
Troy E. Wade II, Wade Associates, Former Assistant Secretary for Defense Programs, DOE, Las Vegas, Nevada

R-95-013

Secretary O'LEARY. Understand that there now has to be a plan laid in and that likely we have shifted costs from one entity to another.

Mr. SCHIFF. In this particular case with respect to weapons programs, if the cost shift is to the Department of Energy, that may well be billed back to the Department of Defense anyway through the weapons program. Is that at least a possibility?

Secretary O'LEARY. You're asking me to not be cynical. In my experience, sir, the cost's always borne here.

Mr. SCHIFF. Dr. O'Leary, I appreciate the fact that you emphasized several times that these were preliminary and sketchy studies that your Department has done and I accept that.

But I would like to ask then, to the best of your knowledge, was the Department of Energy consulted by the United States Air Force before the Air Force made this recommendation to the BRAC Commission?

And I know these are big agencies and I know there's a possibility that someone in the Air Force talked to someone in the Department of Energy. I'm asking you, as one person, did it come to your attention?

Secretary O'LEARY. It came to my attention, Chairman Schiff, about five days before the formal announcement.

But I want to make clear here, being made just earlier this week, that there are lots of things known within the Department's family, which is very broad and widely flung, that are not known to me.

I am clear that there were discussions, but I'm also clear that those discussions were not raised to an appropriate level until relatively late in the process.

I'd also say to my colleagues at the Air Force that I have a clear understanding of how this has happened because, Lord knows, I have sinned on that side as well.

Mr. SCHIFF. Certainly. I think my time has expired. I want to say to the panel that I have to participate in a floor debate right now, so I will turn the gavel over to my fellow co-chair, Congressman Rohrabacher, until I can return. I will recognize Congressman Brown, the ranking member of the Full Committee for five minutes for questions.

Mr. BROWN. Thank you very much, Mr. Chairman. I will confine myself to just one question to Mr. Galvin. I see, Mr. Galvin, as one of your very core recommendations, this corporatizing of the laboratories.

Just for clarification, does that mean all of the labs, or essentially all of them, in one corporate structure or more than one corporate structure involved?

Mr. GALVIN. You'll see a set of consistent alternates, sir. Our fundamental recommendation is that there would be one parent corporation for all ten laboratories and then some some subsidiary phenomenon entity. The definition could apply to each of the ten.

Or we have said if there is any disposition to corporatization, but a more serious reluctance to the corporatizing of the three weapons labs, that one could carve out and apply the experiment only to the seven non-weapons labs. So we have in effect provided a general specification to this aggregation.

Mr. BROWN. In reading your report, and the GAO report, while not identical, there's a considerable consensus as to the need for major changes in the management of the laboratories. I think the Secretary would even agree that that is desirable.

The GAO report does not go as far as you do, but does suggest that one alternative might be the corporatization or the privatization, if other steps to improve management do not succeed. Now, they don't spell that out.

I would like to suggest to you that this might be a particularly appropriate time for some bold organizational restructuring. But the difficulties are very large, as I'm sure that you know.

Do you think it is realistic to proceed with corporatization on the schedule which you suggest, that it could be done in one to two years? Is that realistic from your standpoint?

Mr. GALVIN. The first part of the answer, sir, is that, yes, it is. Those of us that have considerable experience with institutional management, not necessarily government management, but general institutional management, this kind of change could be done.

To relate to that, there's a tradition in the experience base of your having corporatized many other things in our government, to possibly have a transition manager which could bridge from, say, our two years to another year or two, until a finalization is done.

And may I just put an emphasis on a term, or an idiom, or a definition, that what we speak of is not improving, quote, "the management of the laboratories". We speak of the management of the laboratory system, and the system involves all four of the audiences that I addressed.

Mr. BROWN. I note that you reserved some of your strongest criticism for the Congress, and I happen to agree with you in that regard. Although, of course the Department itself, as with all large bureaucracies, is not without sin in terms of making improvements that need to be done. But the Congress has been a major factor.

Obviously, the Secretary's testimony is that this is not a desirable step to take at this time. I'm not sure how the lab directors are going to testify. We'll find that out later. But, I would doubt that they wanted to disagree too much with the Secretary on this.

[Laughter.]

Secretary O'LEARY. They know how to do it, sir.

[Laughter.]

Mr. BROWN. I do think this is a key question. And, as I say, the Congress itself, as you know, has undergone a wrenching reorganization.

[Laughter.]

Mr. BROWN. It might be sympathetic now.

[Laughter.]

Mr. BROWN. In imposing the same sort of wrenching reorganization on the Department. And my concern, basically, is not to oppose it so much as to determine if it is feasible and if it can be done within a realistic time frame. And I hope we can explore that further during the questioning. I will yield back the balance of my time.

Mr. ROHRABACHER. [Presiding]. Thank you very much.

As is evident, the ranking member has a great deal of respect on both sides of the aisle. And we're very, very pleased that you are here to help us this morning. Thank you very much for your contribution today.

I'd like to ask a few questions myself, if I can get them out this morning.

I was a little bit disappointed in the Galvin Report in that there was no recommendation for closing any of the labs. You know, we've heard the need for upgrading facilities and changes.

There's nothing that really brings about change faster and upgrading and a change in structure than a consolidation which forces changes and decisionmaking at the local level as well as at the central level.

Was it just, I noted, that you didn't recommend against eliminating any of the labs, just basically downsizing. Did you just leave this for someone else to decide, or is this just something that you don't want to happen?

Mr. GALVIN. No, sir. We dealt with that situation very directly, and I think you've seen evidence of our ability to stand up with backbone to make bold suggestions.

Were we to have felt that the nation's needs for science and technology within the described missions had attenuated, we would have doubtless made such a recommendation.

We think the science and technology needs of our society for the 21st century are so grand, so significant, so great an opportunity and so needed in the field of let's be sure we do manage the stockpile correctly, you can't abrogate that responsibility. You can't cut that back, sir.

You can attenuate and modify your system, like we are recommending in Livermore. The energy need studies are gigantic. The remediation ecology needs are substantial. You'll find four or five references in our report, sir, to whereas certain current mission activities are oversized, you will probably wish to entertain, and if you can possibly afford it, approve expansions in what the science base of the laboratories will be.

So, when we looked at the needs of our society, we consider that you cannot step back from these responsibilities, and you've got ten excellently established laboratories to take on the bits and pieces of this very important activity. So we don't see an opportunity to cut back.

Mr. ROHRABACHER. Mr. Galvin, whatever program we have a hearing on, I can tell you there's someone there telling almost exactly word for word what you just said about how important it is for the country.

I just have to say, word for word, you could just change the program title, and there it is. It's so important for the future of the country.

It really is important for the future of the country, too, that we bring our interest rates down. We're not going to do that until we bring the deficit down.

It's important for future generations of our country not to be handed $200 billion in debt every year. That's what this is all about.

First of all, Secretary O'Leary, I'd like to compliment you on the job that you've presented to us in terms of the cleanup record of your Department.

I do have—this is not a nice question because that's our job, sometimes, because there was an indication that perhaps Congress and the Department were at fault for some of the lack of efficiency at the various labs, rather than what's going on at the labs themselves.

There is a report today in the San Francisco Examiner of strong opposition within the Galvin Task Force to the National Ignition Facility.

I think you have probably seen this article. What it basically says is that at one point that many more people on the Task Force opposed this than supported it, but you sort of bulldozed it through.

Secretary O'LEARY. I did?

Mr. ROHRABACHER. I believe so. Did you oppose this National Ignition Facility?

Secretary O'LEARY. Before you arrived, I took great care to say that when I asked Bob Galvin if he would chair this task force, I pledged to him, and later, to the fully assembled task force, that I would not meddle in their determinations. And I sought their independent advice.

The advice they offered on the National Ignition Facility was their own. I never tampered with it.

Now, I need to let you and this Full Committee know that I took a full year, much to the consternation of many of my colleagues, to wrestle with not only the details, but the logic for the National Ignition Facility.

When we made that public announcement that we were going forward with our key decision number one, which begins to expend money and sets all of the regulatory work in place, I was a clear advocate of what was being done, not because someone had told me, but because I had taken the time to study the issue.

Mr. ROHRABACHER. So you were an advocate of that?

Secretary O'LEARY. When I came to the decision, but that is my job to come to the decision. On many occasions, I come to the decision on advice given me by others, who are far better trained than I.

If I could just finish, sir, because I believe it's important—I took the time to hear from everyone, and that's the only point I wanted to make.

Mr. ROHRABACHER. Did you make your decision before the Galvin Task Force made its decision?

Secretary O'LEARY. I did indeed. I made the decision as it was timely to make, both as a budgetary matter, because I had to present it in my budget, and because I had made a commitment to my principal, the President of the United States, to make it. My recollection is I made it in the late fall. I believe it was in September.

Mr. ROHRABACHER. It was several weeks before the election and there was a Democrat United States Senator in a very serious race for the Senate at that time in California.

Secretary O'LEARY. I was scheduled to have made that decision long before I even contemplated the election.

Mr. ROHRABACHER. Would it have been better for you to wait for the Galvin Commission to release its recommendations?

Secretary O'LEARY. I would have had an uninformed and unprepared budget presentation for this Congress, and more important, for the Office of Management and Budget, and the President of the United States, whose direction in these regards I take very seriously.

Mr. ROHRABACHER. Thank you very much.

Mr. Galvin?

Mr. GALVIN. Mr. Chairman, may I augment a bit of understanding on this situation? You have revealed a perfectly public fact.

At a given point in time, in the iteration of the Task Force, wherein we use the technique often of how many are for or against something at this moment—a straw vote type of thing—there was a situation where, in just a first look at the situation, a studied look, more people were opposed to NIF than were eventually for it. But that was an early deliberation and I couldn't cite you the time, but I know it existed.

And as we iterated, positions changed. And throughout the period of November, December and January, the last three of our ten months of activities, we continued to put in place what appeared to be the correct position of both the Subcommittee that studied it, and then the Committee. We went through editing after editing, after editing to where the Task Force was always reciting, we are for the NIF on balance. Therefore, that is the correct, final position of the Task Force. We are for it.

Mr. ROHRABACHER. In terms of the timing, would the Chair be accurate in saying that at the time when Secretary O'Leary announced her decision, that the majority of the members of your Task Force actually opposed it?

Mr. GALVIN. It's possible, sir. But I couldn't put my clock to work on that situation.

Mr. ROHRABACHER. Did the announcement by Secretary O'Leary have an effect on the decision of the Task Force?

Mr. GALVIN. Not in terms of the judgment of being pro or con. Incidentally, we respected the fact that the decision had to be made according to normal operating time and procedures, so it was just another fact that we dealt with. We dealt with a thousand facts.

Mr. ROHRABACHER. Thank you very much.

Mr. Geren?

Mr. GEREN. Thank you, Mr. Chairman.

Dr. Galvin, your report urges that the laboratories be corporatized. Could you share with us some of the discussions that you all had, as far as corporatization versus privatization, and what your thoughts are on the possibility of privatizing any or all of them?

Mr. GALVIN. Yes. We started out in kind of loose, conceptual way, by saying we wanted to privatize the laboratories. And as we worked a definition of these to our satisfaction, we looked upon privatization as being characterized by transferring the ownership of the assets, the equity in effect, to a private entity. And privatization would mean that the entity was then responsible to find its own funding.

Corporatization, to us, is defined as allowing that the citizens, the Federal Government will continue to own the institution, but the organization that will run it would be a corporation styled after the private sector, non-profit, and that it would look to the Federal Government as being the primary customer and therefore, the primary funder of the activities, as it has been in the past.

So those are the two classes of distinguishing features as to why we use the term corporatization versus privatization.

Mr. GEREN. Could you share some of your thoughts on why you went the corporatization route rather than the privatization route?

Mr. GALVIN. Yes. We did not think it was appropriate that these cherished national jewels would be owned by a single entity that was not associated with the government. I don't think there's any single entity that could afford to pay or acquire them.

We think that it is the Federal responsibility to stay the course on the national security issues, which are about 25 percent of the total budgets of all these ten laboratories.

We think the energy issue is very fundamental to society and could not be afforded by a single energy industry, at least not yet.

The remediation issue is clearly an inherited responsibility from the government. All these things suggested to us that this mix that we just described, who owns versus who operates, was an appropriate mix.

Mr. GEREN. Thank you.

Secretary O'Leary, could you talk about how the Galvin Task Force fits into other task force activities that are expected to report this spring, including the Yergin Task Force on Research and Development Priorities, and the Strategic Alignment Task Force which is seeking ways to streamline the Department?

Secretary O'LEARY. I can indeed. Earlier, I had begun to testify by citing the fact that we examined the strategic vision, and Bob Galvin has just very eloquently laid them out once again.

The next step was to get at contract reform, because fully 83 percent of the funds that the Department has under its trust from the Congress of the United States and the American people is expended through contractors.

And what I knew, when I came into contemplating to take the job, was that we had not managed very well with cost plus contracts, so we set about to understand how we'd come to that sorry end.

And have now reformed the way we contract to focus on performance, and pay for performance. That is the first piece, and we've seen value returned and savings already recognized from simply negotiating for specific work and reducing the cost of our contracts.

The next piece of it was the clear recognition that the labs were our most valuable and core asset of the Department of Energy, and perhaps the nation, by extrapolation.

And I understood the issues of micromanagement. I understood that the issues of alternative uses and the need to have the missions of the labs validated and also the way we run the strategic mission of the labs.

So then we conceived the idea of a task force from the Secretary's Advisory Committee, and that's where Bob Galvin came in.

The next piece of it was to begin to examine that piece which we call our appropriate technology, and ask ourselves the questions that Congress and the public rightfully ask. Are we deploying the right technology? Are we doing it appropriately? Are we organized to do it well? And most importantly, are the appropriate technologies we're deploying so high risk that the government ought to have an investment, which amounts to about 47 percent of the share of the work we're doing. And in these tight budget times, what should we stop doing?

That is the work of the Yergin Task Force. In that area, I'm committed to find $1.2 billion worth of savings over the next five years.

The final piece of it at the bottom is the Committee on External Regulation, which has to do with the regulating of our nuclear facilities and its safety and its environmental work.

That Task Force was formed today. The President, rightfully I think, decidedly wanted an independent Task Force. It met today. I've asked them to report to me by the end of this year. That's a very quick timetable, a bit faster than the Galvin Commission, which did it in one day short of a year, but they said they'd deliver in a year, and they did beat it.

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There are some who believe that that is best done outside of the Department of Energy. You need to know that most of the work that the Department does has never been regulated externally, so this is work of a first impression.

I've assembled a group of very informed individuals, whose resumes I will leave with you today in that press release.

The final piece up at the top, which is attached to a strategic plan development, is a strategic alignment of the Department of Energy, whose work will be completed in its recommendation phase by the end of April, I would think about the 30th of April.

That is the opportunity to let us get at the multilayers, the many organizational structures belonging to the Department of Energy, who oversee and may, of necessity, be performing non-value added work.

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So in sum, all of these initiatives, which were begun almost the day I arrived, will permit us, as a Department of Energy, to run the place more like a business. And I'm clearly recognizing, having come from the business community, that we'll never be completely like a business, but we can do it better, and I'm committed to do so.

We've already recognized great savings. We can and are committed to do better.

Mr. GEREN. Thank you.

Mr. ROHRABACHER. Thank you very much, Secretary O'Leary, and we wish you the best of luck in saving those dollars by making it more efficient.

Congresswoman Morella?

Ms. MORELLA. Thank you, Mr. Chairman. I appreciate your appearance and testimony, Secretary O'Leary. Mr. Galvin, thank you for the work you have done and your Task Force has done. I wanted to also thank you, Mr. Chairman, for the joint Subcommittee hearing.

On the Technology Committee, we're also very interested in following through later with concepts of technology transfer among the laboratories, because I do agree they are a national treasure.

I wanted to pick up, Secretary O'Leary, on Mr. Geren's question, because I also understood that the White House Science Office was putting together or trying to pull together the kind of tripartite study with the Galvin Report, Defense and NASA.

I wondered if you might give us an update. When is that going to be presented? Is it going to make a big difference? Do we know at this point?

Secretary O'LEARY. Today, Congresswoman Morella, today I'm proud to tell you that the Department of Energy is the only of our sister agencies who asked for a total outside look by a broadly-based and experienced group of outsiders.

What we have done in keeping our commitment to the President and his Interagency Council on Laboratory Review is to provide the full Galvin Task Force text with the comments, many of which I shared with your colleagues before you arrived, and other appendices with a set of clearly defined initiatives that the Department of Energy will undertake to deliver on the commitments that we've made, resulting from the 29 generic recommendations.

So we have filed our report today. That report will be synthesized. And now my recollection is that the plan is to use that synthesis and the recommendations that will be made to the President to inform the fiscal year 1997 budget process.

So you will see this work not only endorsed in what we do this year, as I have outlined, but also endorsed and further refined from an Executive Branch perspective in the budget that we present for fiscal year 1997.

Ms. MORELLA. As the preparation from that report is formulated, when do you think that we will see what the basis of the budget is going to be predicated on? In other words, what's the time line on it?

Secretary O'LEARY. With respect to the Department of Energy, we have made a number of budgetary commitments, first to the President, then to the Congress, and the testimony that we have provided on the budget this year.

But we will be delivering in full measure in our fiscal year 1997 budget on the recommendations that we made to the President and he accepted.

I'm after savings of approximately $14 billion over five years, presuming that we can also sell assets. So you will begin to see that very dramatically in the fiscal year 1997 budget.

What I also need to inform you is that the recommendations coming from the Galvin Commission generally can be implemented with the administrative authority that I and the President have, with lots of help and assistance from OMB, save the one piece on governance which does require this Congress to take some action.

Ms. MORELLA. Mr. Galvin, I know I have limited time, and I'll probably be submitting some questions. But do you think that the work you've done also applies to other laboratories? Would you like to comment on that?

Mr. GALVIN. First off, the Task Force is only capable of responding, and I am its spokesman, on the ten laboratories.

If I may step out of the role of being the Chairman of the Task Force, as a citizen that is rather experienced with a fair number of other laboratories, yes, the concept could be applied literally to many other laboratories.

Ms. MORELLA. I wondered if Secretary O'Leary wants to comment on, or maybe you, Mr. Galvin, what you see for the future of the connection between universities and laboratories? Is this another area that we should be reviewing or doing something to be energized or pulling back from?

[Laughter.]

Alphonse and Gaston.

Secretary O'LEARY. I think both of us are very anxious to answer this question, not so much as I to answer it definitively, but to let you know that I am well aware of the fact that as we focus on downsizing budgets generally, universities with whom we have strong partnership—an example would be in our energy research area—25 percent of the budget expended there goes to our universities.

This is important work to be done, and as we move forward with shrinking budgets, we're very much concerned that we're making the appropriate balance and providing for universities an opportunity that they can participate in our research.

Often they don't bring the multidisciplined experience that our laboratories bring to the table. So this is an area that we need to watch very carefully. It needs to be advised very carefully.

And I have directed Charles Curtis, our Under Secretary who has the responsibility for implementing most of these recommendations, that he is to come up with a plan to ensure that as we move forward, that we are not taking away from universities the tremendous capability that they have had through the work that they've done with us.

I am mindful of the fact that there is a tension here, and I am not certain we can satisfy fully the universities' needs or desires in this time of budget stringency. But that will be the case with the labs as well.

Mr. ROHRABACHER. Thank you very much.

Mr. GALVIN. When you finally have an opportunity to read our report in detail, you will find that that is an expanded on advocacy of the Task Force. We're very positive about the need for and the opportunities of better integration.

Mr. ROHRABACHER. Thank you very much, Mr. Galvin, Secretary O'Leary.

Mr. Roemer?

Mr. ROEMER. Thank you, Mr. Chairman. Welcome, Dr. Galvin. It's always nice to have the Secretary before our Committee.

I'd like to put my question in the context of not this room, but the changed political environment of the last few months.

I couldn't agree more, Dr. Galvin, with your analogy that our National Laboratories are our national jewels and treasures.

Now, there are certain proposals out there that want to eliminate the entire Department of Energy. And Budget Chairman John Kasick has now said that he agrees with that approach.

I don't think we should steal the national treasures and the jewels. I do think, however, that they need polishing and they need to be reset. We do need to restructure these National Laboratories and downsize them in an environment of diminishing resources.

I'm in the process, Dr. Galvin, of drafting a bill that would do three things. One, downsize the number of full time employees at the National Laboratories. Secondly, end self-regulation by DOE of safety issues. Thirdly, look at terminating one, possibly two, of the facilities.

Does this approach coincide with your approach in your report? And I know you did not recommend closure, but is that generally an approach that you would agree with, especially in light of the political circumstances?

Mr. GALVIN. I'm aware of your proposed legislation, sir. And I think the Task Force would be comfortable in supporting the section of your bill that circumscribes the regulations aspect and the applying of the standard regulations for health, safety, etcetera of the other agencies of the government.

But not having specific regulations within the Department of Energy at all, the Task Force would not have had a chance to evaluate your proposals about cutting the labs back by ten percent over certain lengths of time, etcetera.

Therefore, it's not able to answer as a body. I'll take the liberty, sir, of answering as an experienced institutional leader, and I respectfully suggest that whereas I think you are stimulating an important debate as to what the expectation levels would be, that the mechanics that you prescribe would be counterproductive.

Mr. ROEMER. What mechanics would you suggest?

Mr. GALVIN. The way to manage an institution today is to have the institution define what it ought to do within levels of expectation, but not prescription. When you have command and control management, you have counterproductive management.

That's what we've had for years in so many of the institutions in our government, and particularly the Department of Energy.

And it's coming from the private sector. The companies that are showing great progress in terms of reducing their costs, etcetera, do so in a very different governance way than prescribing mathematical goals such as you have prescribed.

So in that regard, as a private citizen, I would be cautious about setting specifications in legislation. We're going to need legislation. If you want to adopt some of the more expansive ideas that we have suggested, and therein you can set policy, but you shouldn't prescribe tactical details.

Mr. ROEMER. Let me follow up on that question, and I would like to work with you more on the mechanics and the processes here. I think that's an important point that you make.

Mr. GALVIN. Thank you.

Mr. ROEMER. But certainly a ten percent reduction is better than total elimination.

You suggested in your report that the Livermore Defense Research activities could be transferred to Sandia or Los Alamos Laboratories.

Can you explain, in a little bit more detail, what your vision for Livermore is in this respect?

Mr. GALVIN. Yes, sir.

The Livermore resources are vital to the on-going welfare of our country and national security. Even if you proceeded over five and/ or ten years, to remove atomic weapon design from Livermore, which is the essence of our suggestion, the Livermore competencies are going to be required, and you're dealing with issues of proliferation, counter-proliferation and intelligence, the things that become anecdotal like Korea, like Iraq, etcetera.

Therefore you're going to need the substance of that institution. In particular, we're saying that whereas before we thought we wanted to have two labs that are designing weapons so that we have competition and in effect peer evaluations, we think that you can substitute that class of peer review with something else that is less formal, and therefore burdened with a specific budget for design. It's an immensely complex, detailed factor, sir.

May I just tack on one little substance idea in order to hopefully encourage you?

If you specify, in a piece of legislation such as you have suggested, a ten percent reduction, the expectation is too low. If you read again the entire part of our recommendations, we are saying that the system, starting with the Congress and the Department, where the biggest cuts should be made, down into the effect on the laboratory, you might save 50 percent of the cost of doing what you're doing.

But you ought to be doing some other things, although that's challenged by Chairman Schiff, when he commented—I'm sorry, Chairman Rohrabacher, when he spoke. So the results per project and program, you should save way more than ten percent.

In the private sector, when we go after certain things, we think of a minimum of 20 to 25 percent, in terms of the ability of our achieving better efficiency. That can happen with ease in the laboratories. Then you can get more bang for the buck.

Mr. ROEMER. Thank you.

Mr. ROHRABACHER. Mr. Galvin, we certainly hope that what you are talking about is achieved, and the taxpayers will be very grateful to you if, indeed, those types of savings with the result of your study and the hard work that you've put in.

Mr. Barton?

Mr. BARTON. Thank you, Mr. Chairman. I appreciate this hearing, and I appreciate these two distinguished witnesses.

I'm Chairman of the Oversight Investigation Committee of Energy and Commerce, and I plan to do a series of hearings sometime this year on the overall mission of the Department of Energy.

I want to say on the record, as someone who's worked in the Department of Energy, as someone, since I've been in the Congress, who's worked with the Department of Energy, I have the highest respect for the current Secretary and the previous Secretaries, and I certainly have great respect for the Chairman of the Board of Motorola.

I think there's a 25 percent chance we'll eliminate the Department of Energy in this Congress. I think there's a 50 percent chance we'll restructure it, rename it, reallocate its resources, and I think there's a 25 percent chance that the status quo will prevail and we'll just reduce the budget. So there are some big issues here.

I want to focus today on the National Laboratories because that's the focus of the hearing.

And I want to ask Mr. Galvin if we were to privatize, it's been said in these two reports, that $100 billion has been invested over the last 20 years. We've got a $6 billion annual budget, 50,000 employees.

If we were to put these national jewels on the market today, what would they bring?

Mr. GALVIN. What was the predicate?

Mr. BARTON. What would they bring if we were to privatize?

If you went to your board at Motorola and said these ten or eleven laboratories are available for purchase, what would you recommendation be as to the purchase price you would offer?

Mr. GALVIN. I don't think they'd bring a penny.

Mr. BARTON. So they're not national jewels?

Mr. GALVIN. Oh, they are, sir. There's no contradiction in what I said. No one in the private sector, or aggregate of the private sector, could afford; therefore, there could not be an offer or a bid made. But everyone of us—I shouldn't say that—almost everybody that has a chance to look at the laboratories says they are immensely valuable, common-based institutions that our country needs, for which, when the sciences derived therefrom, the private sector will convert into major values to our society. But you couldn't sell them at this time, because there's none of us big enough to make an offer. There has to be some common resource.

Mr. BARTON. All right, we'll approach it from that direction.

If in fact there is value, and I think that there is value, I don't think we're getting $6 billion a year out of them. I don't think we need 50,000 people.

I believe there has to be a Federal role in weapons manufacture, weapons maintenance, weapons design. That's a Federal role.

I believe that basic research is not going to be done, in many cases, on a large-scale level by private industry.

So I think there are two functions there that the Federal Government has the responsibility for.

But if you set the weapons side of it apart, and the basic research function, how much should we be spending in Federal dollars on that function?

Should we be spending $6 billion a year?

Should we be spending $3 billion a year?

And how should we be spending it?

Mr. GALVIN. First off, the system doesn't need $6 billion, and when you allow for or presumably achieve, the efficiencies that are represented by the Secretary that she would hope to achieve, you can get by with a lot less than $6 billion.

When you've carved out the defense, that's at least 25. There may be a different number that the experts could give you, and that is what you carved out, sir. But my guess is that you would find substantial value to the sustenance of something on the order of $3 to $4 billion for non-defense activities by the central laboratories in order to serve the universities that have been brought into the discussion here today, in order to serve the solution of other problems like remediation and the assurance of efficient energies and cleaner energy sources, etcetera.

Sir, I'm now speaking I think with a reasonable instinct, but not as an expert, in terms of having factored numbers.

Mr. BARTON. Thank you, Mr. Galvin.

Madame Secretary, in my brief remaining one minute, I'm told that you created an internal review in your Department to encourage them to come forward with suggestions and asked to be bold in all of this.

And that recently, when they did that, you or somebody very close to you basically told them that that was too bold and to back down, go in a new direction.

Is there any truth to that, or is that just a malicious rumor that circulated its way up to Capitol Hill?

Secretary O'LEARY. Like most of the rumors that circulate about the town, it's about half true. We had a very public hearing last week, which was the first public discussion of the alignment activity on-going in the Department of Energy.

It's a very serious effort. I just said earlier, these people have a bogey to bring down, of $1.4 billion in savings. And what I asked the various groups who were reporting publicly to do was not to present their conclusions, but to present their rationale and their options because recommendations had not been wholly vetted nor were they informed by facts.

I did not believe that people would take them seriously because they had not been informed by facts.

There will be three subsequent meetings of this structure team with its public advisory committee and they have a date of April 15th to bring recommendations. And I owe them to the Congress.

Mr. BARTON. I would encourage you to encourage your people to be as bold as possible, because I literally believe if there's going to be anything close to a Department of Energy, we're going to need some very bold suggestions.

My final question—

Mr. ROHRABACHER. Mr. Barton, your time is up.

Mr. BARTON. My time is up?

Mr. ROHRABACHER. It's already expired. What other members would like to ask questions?

[Show of hands.]

Mr. ROHRABACHER. Let me note this. You may submit your questions for the record. We'll be happy to do that, but we have promised our prominent guests here today that we'd get out by 11:00.

Is there any chance that you could stay an extra ten minutes? If not, we'll just call this panel.

Mr. GALVIN. I have no problem with staying, sir, until lunch time, but I respect the fact that the distinguished heads of the laboratories are also here.

Secretary O'LEARY. My issue, Mr. Chairman, is that I have a commitment downtown. I had indicated that I would be there by 11:20. I have to make a public address.

Mr. ROHRABACHER. Madame Secretary, why do we not let you leave at this point, and ask Mr. Galvin to stay for an extra few minutes?

Secretary O'LEARY. I would be grateful.

Mr. ROHRABACHER. I want you to know that although sometimes my questions are very pointed, and that's what democracy is all about, that I think you're doing a fine job and you are working very hard, and I know you are very sincere. So I wish you well, and I really appreciate you coming here today.

Secretary O'LEARY. Thank you very much, sir.

Ms. JACKSON LEE. Mr. Chairman, would you yield here a moment, sir?

Mr. SCHIFF. Yes.

Ms. JACKSON LEE. I appreciate the schedule of the Secretary. How are you? I'm Congresswoman Jackson Lee. I have a great interest in this area. I appreciate the fact that I was unable to be here at the beginning of your testimony. I would like to have my office offer written questions and I would gratefully appreciate it if we had an opportunity to discuss those, either by way of writing, or further meetings with your Department.

Secretary O'LEARY. Congresswoman Jackson Lee, I would be pleased to receive your questions. I will respond to them in writing. I will also phone your office today to make an appointment. I will follow up personally, or will just come and discuss them.

Ms. JACKSON LEE. Thank you very much.

[Laughter.]

Mr. ROHRABACHER. I would recommend to the Secretary that she make her retreat now before the Secretary's schedule is entirely eaten up.

Thank you, Madame Secretary. Ms. Lofgren might have some questions for Mr. Galvin.

Ms. LOFGREN. Thank you, Mr. Chairman. Just a few quick ones. I know we have another panel that we need to listen to.

First, I really enjoyed seeing your careful report and thoughtful recommendations and the creativity that you brought and the new thinking on how we can still fulfill our mission and do it better and more efficiently.

I was interested in the recommendations about the sharing of research with industry and the need to improve the articulation between industry.

At the same time, your warnings that, I think, are also thoughtful to avoid being short-term, and to avoid being a job-shop, as the Secretary had said.

I'm interested in what your thoughts are if we were to restructure, as you suggested, or to restructure as the Secretary suggested, how do we achieve the goal of better articulation between industry and the labs without falling into the trap of short-term thinking and job-shopism?

Mr. ROHRABACHER. I might remind the members that we have about two minutes for each member who wants to ask questions.

Mr. GALVIN. A very short answer.

To illustrate a variety of possibilities, you will see the term "roadmap" repeated in our report a number of times. I respectfully suggest there is a major benefit for our society to learn better to use technology roadmaps.

Example: The semiconductor industry now has the most sophisticated one.

When a combination of forces—the university people, the government people, the laboratory people, and the industrial people—write a really significant roadmap on any particular line of science, that achieves buy-in. Now you have people who really come together with greater enthusiasm.

This is an instrumenting phenomenon, in terms of institutional management. It is these kinds of things that many of us have learned to do. There were not significant roadmaps, until we in the semiconductor industry created the best one.

There are others that were models earlier. There are great opportunities. That's just an example of how that would occur.

Mr. ROHRABACHER. Mr. Baker?

Mr. BAKER. Thank you very much, Mr. Chairman. I'll address my statements to Mr. Barton and to you, if I may.

The reason we're free today is because of the investments we made in the National Laboratories. We did not blow the Eastern Empire off the map. We out-researched them and we out spent them.

We economically devastated them, because their scientists outside of Moscow and our scientists at Los Alamos and Livermore all knew we could build brilliant Hubles and we could make all of their nuclear stockpiles worthless.

So the military savings we have today are the direct results of the investments we made yesterday. We could not downsize our military if we were still in a cold war with the Eastern Bloc.

The question now is what do we do with these assets.

Do we sell them to the highest bidder?

Or do we patiently convert the nuclear and military secrets to the commercial area?

Do we work on transportation, communications, smart highways, medical breakthroughs?

The Fisher imaging, which is going to take laser science into breast cancer research, is going to save 10,- to 50,000 lives a year. That's a military secret at Livermore through laser technology, that's going to be made commercial.

So I only have one question for you, and I appreciate your honestly, Dr. Galvin, in answering these questions.

And to the Chairman, I'd like to remind him that you are Chairman of the Executive Committee of Motorola, you're not here to sell food stamps or to push labs. You don't run a lab.

You're a businessman. When asked the direct question, should we close the labs or should we spend more money on science, you answered very directly, yes, we should.

So this is not a guy pimping for a government program, this is an expert, and I appreciate your directness and your honesty.

Lastly, my disagreement with you is should we attempt to separate nuclear research of the future with commercialization of research, and I'd like to harken back to the NIF program. If we indeed split atoms and the nuclear enhancement with lasers, can we separate that technology from defense to energy?

Can we say, oh, Livermore's out of the defense business because we said so, we, government in Washington? When you split that atom, don't worry about any military findings that you might have.

It's as foolish as trying to create a green lab and saying don't find any power sources, don't find a smart highway, only work on the environment.

We can't do it. I don't think you can separate science that way. Would you please comment because I've used my two minutes?

Mr. GALVIN. Nuclear weapons are an energy. Nuclear energy is an energy. They all sing together.

Mr. BAKER. So your recommendation in the Galvin Report, to take the nuclear weapons research out of Livermore at the same time we're building NIF there, might be good for restudy?

Mr. GALVIN. We believe that a particular part of the responsibility of Livermore is attenuatable, reducible, but there will still be substantial remainder activity there, if you follow our guidance, that will have these people engaged in substantial nuclear science that will help the weapons situation. I am not trying to be vague about this. But it's an artistic decision, sir.

Mr. BAKER. Our speaker, who is a science wonk, carries around a little chip with seven motors like a credit card which he claims from MIT, but it really came from Livermore. He is a scientist, but he's a cheap hawk. We're going to make efficiencies and we appreciate your directness in your report.

Mr. ROHRABACHER. Thank you very much, Mr. Baker, testy as usual.

Ms. Jackson Lee?

[Laughter.]

Ms. JACKSON LEE. Thank you very much, Mr. Chairman.

Dr. Galvin, thank you for at least indulging us for a moment, and I understand now that I've got less than two minutes for saying that.

I will not ask about the National Laboratories. I think my colleagues have effectively focused on those questions. I'll do some additional reading and possibly be in dialogue with you on that.

I would simply like to ask, as we look at the Department of Energy, and I think we've chronicled its origins and the intent of its origination, if you could give me some sense of whether you think there is value in an entity like that, in directing a national energy policy would certainly include how you would address the National Laboratories and the technological research, nuclear weaponry, nuclear research, but as well some forgotten technologies, like oil and gas, to a certain extent, and how we deal with effectuating a policy that most generates jobs and most generates a solid energy economy. Is there a role for an agency, either reformulated under maybe your guidance, but as well, some of the issues that have been made clear here by the Secretary, to have that kind of governing body?

Mr. GALVIN. Whatever you call it, you need an entity that must be the sponsor, and must be the customer of these pieces of wisdom which are then applicable.

Therefore, though our Task Force did not presume to engage in the policy determination of the total structure of the United States Government, we are in agreement that someone must sponsor these kinds of activities and someone must be the customer for these kinds of activities. And you can call it what you want.

You're going to have something that provides you your engagement with this need for our society.

Mr. ROHRABACHER. Mr. Bartlett?

Mr. BARTLETT. Thank you very much.

I had a question for the Secretary, and it was the basis for a question to Mr. Galvin, so let me pose my problem that generated the question to the Secretary.

We are now several years into the post-Cold War period. We are neither making nor testing nuclear weapons. Yet we have now about 2,000 more people from roughly 21,000 at the peak of the Cold War of '79, to nearly 23,000 in 1994, people working in the defense laboratories. And I just wondered how the Secretary would respond to that. But I think that this reality begs the kind of analysis and recommendations that your Commission made.

I have introduced legislation which would establish a Commission similar to the Military Base Closing Commission, to take a thorough look at each DOE lab and what they did, and then make binding decisions, in the aggregate, that would then either be voted up or down in the aggregate, by the Congress, just like the BRAC report, how to reorganize, consolidate or close elements of the labs.

What's your view of this approach, that would specifically define the missions of the labs and ensuring that they concentrate on their areas of excellence?

Mr. GALVIN. My guess is, and this is a risk for me to dare to speak for the Secretary, whom I deeply respect, that our answer would be rather consistent in the following regard.

That there is a testing program going on with regard to laboratories. We call it stockpile stewardship, scientific based testing. The lab directors will explain it to you more lucidly.

We must know that the remainder weapons are workable and will work tomorrow. You must go back over your inventory without ever exploding a weapon and knowing from a science based analysis of what's there that it will work.

You're going to have to modernize, as time goes on, because things age even in inventory. You've got START I, you've got START II, you've got all kinds of things from a national policy standpoint that have to be dealt with that are somewhat beyond my knowledge and purview.

But I respectfully suggest, sir, you've got a very long term, by decades length, of time responsibility. You cannot abdicate, as Federal officials, with regard to the stewardship of that stockpile.

I'm sorry, I'd better stop at that point just because of time. I think the rest of our answers are written, or I'll be glad to respond in writing.

Mr. BARTLETT. That really wasn't the question that I wanted an answer to. I agree with your concern that we maintain a—

Mr. ROHRABACHER. If you want to have a follow-up, go right ahead.

Mr. BARTLETT. Actually, the question I asked was, what was your view to the approach of setting up a commission similar to the Base Closing Commission that would make recommendations to the Congress that we would vote up or down in the aggregate?

What you have now done is to make recommendations which may or may not be, which the Department and the Congress may or may not choose to effect.

We would like to depoliticize this process just the way that the base closings or reorganizations consolidations have been depoliticized. This has worked very well in that area. We suspect that depoliticizing the process would be equally beneficial here.

Mr. GALVIN. That is a process that you are certainly free and have used in the past. Our Task Force really cannot deal with the base closure issues, sir.

Mr. BARTLETT. Thank you.

Mr. ROHRABACHER. Or the lab closure issue, I might add.

Mr. GALVIN. I thank you for that appropriate correction.

Mr. ROHRABACHER. Mr. Wamp?

Mr. WAMP. Quickly, Mr. Galvin, I, too want to thank you and all of your Committee for their labors.

Clarification—if my memory is still alive after the Contract with America, the five primary functions that your report recommends for the labs—science, energy, waste management technology, and national security—I think those five—then you recommended that technology transfer should not be one of the primary functions of the labs.

I just want to clarify that that only includes the ten labs that you had purview over and that you didn't look into other facilities like Y-12 in Oak Ridge, and you weren't casting aspersion on technology transfer in general across the nation as a primary function of the Department of Energy, for instance, but particularly your work was involved in these ten labs and these labs, having had a hands on priority functions, correct?

Mr. GALVIN. No, sir. We're dealing with a definition of terms. To the extent that anyone employs the idiom "technology transfer," as being a let's create jobs on a short-term transfer of data that can go into a factory and hire a hundred people, we're saying that should not be a primary issue.

But as a matter of fact, as soon as technology is learned, it must be transferred. Science-based information must be transferred. The labs are good at that.

One of my great concerns is industry doesn't reach out enough for this. And that's a process that ought to be enhanced. So there should be extensive technology transfer.

We speak positively about technology transfer, but don't go out looking for a strange new mission just because some company would like to have some help in developing a product.

I'm being pejorative in that statement. It's that range and extent of things. Within the missions, there should be liberal technology transfer.

Mr. WAMP. Technology transfer across the board should be one of the primary benefits of these jewels that we keep talking about.

Mr. GALVIN. All within the mission.

Mr. WAMP. David, thank you.

Mr. ROHRABACHER. Mr. Graham?

Mr. GRAHAM. Again, thanks for participating in what I think is the real key to the 21st century. Environmental management. The budget has been reduced by about $4 billion from President Clinton's recommendations.

How do you feel about reducing the environmental management budget in DOE, and have we gotten a good return on our money in that area in your opinion?

Mr. GALVIN. I cannot speak of course to the most recent decisions of the Administration. Our Task Force didn't take cognizance of that.

But in our estimation, the money that has been expended, indeed, with some results, as the Secretary has attested to this morning, have on balance not been affected because we're not using entirely the right technology.

To the extent that one tries to clean up something with the wrong soap, you aren't going to get a good clean face. So one of the things we recommended is more involvement of the laboratories, better development of what is the technology to be used, put the right technology to work, back off of this business of spending money just to spend it because you've got an agreement with the community, and lots of things of that nature.

So this whole thing could be done with less money and more effectiveness, with better integration of the laboratories helping with the definition of what the science should be.

Mr. GRAHAM. Do these technologies do this now? Could I have one more question?

Mr. ROHRABACHER. Go ahead and ask it.

Mr. GRAHAM. Tritium, you mentioned briefly about tritium in the report. Do you believe that tritium production is necessary to begin now? Or how long are we going to wait before we produce tritium?

Mr. GALVIN. Sir, the answer to the question from me is yes. May I defer, if that question needs to be pursued further, and I'm sure it does for you, that you deal with the gentlemen who are the lab directors, who can explain the justification for it. And they did justify it to us. We're quite impressed with the recommendations for that continuation.

Mr. ROHRABACHER. Thank you.

Mr. Salmon?

Mr. SALMON. Thank you, Mr. Chairman.

Mr. Galvin, it's great to have you here today. I know you're in a hurry.

Mr. GALVIN. I'm in no hurry, but I respect these lab guys.

Mr. SALMON. We do too.

Let me just ask a question that's been bothering me for a long time. I think the single biggest most colossal failure of the Department of Energy is the disposal of nuclear waste as applies to private nuclear facilities across the country.

Could you give your assessment, and I know it has to be quickly and maybe we can get some more later, on the whole Yucca Mountain debacle, and what your recommendations would be for the future?

Mr. GALVIN. Again, sir, I would recommend that if you could find the time, to zero in on that section of our report. We are fairly definitive about organization changes in the Department, of which they've made some good ones. We think more can be made. Policy standards, technology changes, etcetera. We think a very major effectiveness, efficiency and cost saving, better job being done, proposition can be done and they're working hard to get it done better in the Department already. I refer you, sir, to the written part of our report that I think is very professional in that regard.

Mr. ROHRABACHER. Mr. Gutknecht?

Mr. GUTKNECHT. Mr. Chairman, I was going to ask about Yucca Mountain as well. I think you've already referred me to the written report, and I will do that. But I would hope, and the Secretary volunteered to volunteer to some written questions, and I'll submit those as well.

Mr. ROHRABACHER. I want to thank Mr. Galvin and Secretary O'Leary for being with us today. I think this has been an excellent back and forth. I think we've learned a lot. That's what the purpose of these hearings are all about.

I want to thank you, Mr. Galvin, especially for the hard work you've put into this report. We are very grateful. It gives us the opportunity to save taxpayers' dollars. We won't do that unless we implement some of the suggestions that you have put forth. We will be watching very closely to see that that happens, and again, thank you. We're ready for panel number two.

[Pause.]

Mr. SCHIFF. [Presiding]. While we're having the change of the witness panel, I again want to remind my colleagues that both Secretary O'Leary and Mr. Galvin offered to answer questions in writing. So that if you did not have the opportunity, I'll understand. This was such a broad and important subject, if you didn't have the opportunity to ask all of the questions that you might have wished to ask, if you will submit them to me, I will submit them to Secretary O'Leary and Mr. Galvin.

I would like to welcome at this time our second panel. Dr. Siegfried Hecker is the Director of Los Alamos National Laboratories. Dr. Bruce Tarter is Director of the Lawrence Livermore National Laboratory. And Dr. Albert Narath is President of Sandia National Laboratories. And of course, collectively, they operate what have come to be known as the Defense Program Laboratories of the Department of Energy.

Gentlemen, I want to say that if you have prepared opening statements that your opening statements will be, without objection, made a part of this record. I invite you to proceed as you would think appropriate. I'll begin with Dr. Hecker.

STATEMENT OF DR. SIEGFRIED HECKER, DIRECTOR, LOS ALAMOS NATIONAL LABORATORIES

Dr. HECKER. I have a written statement that I have submitted. I will just be happy to answer questions.

Mr. SCHIFF. That's fine. That's a perfectly acceptable response. But I want to give you the chance, if there's something that you want to say.

[The prepared statement of Dr. Hecker follows:]

TESTIMONY OF SIEGFRIED S. HECKER,
DIRECTOR

LOS ALAMOS NATIONAL LABORATORY

JOINT HEARING

of the

BASIC RESEARCH SUBCOMMITTEE

and the

ENERGY AND ENVIRONMENT SUBCOMMITTEE

of the

COMMITTEE ON SCIENCE

UNITED STATES HOUSE OF REPRESENTATIVES

March 9, 1995

TESTIMONY OF SIEGFRIED S. HECKER, DIRECTOR

LOS ALAMOS NATIONAL LABORATORY

MARCH 9, 1995

Thank you for the opportunity to provide a statement for the record of this hearing. I would like to make three main points:

1) At Los Alamos we believe that our principal mission for at least the next decade is to *reduce the global nuclear danger*. To perform this mission well we must nurture a strong science base and function as a multiprogram laboratory.

2) I concur with most of the recommendations made in the Galvin Task Force report and I am encouraged by the actions outlined by the Department of Energy aimed at responding to the recommendations, and

3) I urge Congress to allow the Department to redefine its missions and the role that the laboratories can play to accomplish these missions. After the roles and missions are redefined and the laboratories current oversight burden is decreased, then the laboratories can be right-sized for best productivity and service to the nation.

Introduction

The Los Alamos National Laboratory, along with its sister laboratories in the Department of Energy, is a critical element of the nation's defense capability and science and technology base. Three of the laboratories are the custodians of nuclear weapons design, engineering, and related technologies. The laboratories also provide support for U. S. universities and industry through their operation of user facilities and through the performance of research and development in many areas of science and technology. The laboratories have shown again and again the ability to develop new capabilities in order to execute programs and projects of national significance. They have the ability, unmet by other institutions, to respond substantively to complex, long-term, cross cutting issues of national importance. This flexibility stems from the ability to form effective interdisciplinary teams to solve complex problems and allows the laboratories to respond quickly to emerging national needs and emergencies. The laboratories are now facing several major challenges.

First, with the fall of the Berlin wall in 1989 and the collapse of communism in Eastern Europe, the parameters of the global nuclear equation fundamentally and irreversibly changed. This change has forced the laboratories to confront their missions and redefine their role in the national security area. I believe that Los Alamos has an important role to play, a mission as important today as it was 50 years ago.

A second challenge is the quality revolution in U. S. industry, which has shown that management by prescription and audit does not lead to the most effective outcomes. I believe that Los Alamos is well on its way to creating a research and development environment in which quality principles, learned from the best in the business world, are central to our operations.

Finally, there are rising expectations from the public that we will conduct our business in an open manner, with full consideration of the environmental consequences of our activities. Los Alamos is responding to these expectations through enhanced environmental programs and by developing a much closer working relationship with local communities.

At Los Alamos, the Department's Tiger Team in 1991 underscored the need for change. We decided to change the way we did business across the board and began a process of change which is continuing today. Two years ago, we embarked on a journey that has led to restructuring, downsizing, and streamlining of our management. Last year, under the scrutiny of the Galvin Task Force's deliberations, we refined and clarified our mission. As a result of these actions, I believe we understand well our new role and our responsibilities to the nation.

A Compelling Mission

Our central mission evolved from developing the first atomic bomb during the Manhattan Project to developing nuclear weapons for deterrence during the Cold War. We accomplished both successfully. Today, the Cold War cycle of nuclear weapons development and deployment has ended and so our central mission must reflect the incredible global events of the past five years. In conjunction with the Department of Energy we define our mission as helping to *reduce the global nuclear danger* to ensure a more secure future.

Reducing the nuclear danger still calls for nuclear weapons *stockpile stewardship*—keeping those weapons that the nation needs safe, secure and reliable. Stewardship has actually become more challenging in a world in which the nuclear weapons will remain in the stockpile long beyond their originally designed lifetimes and one with no nuclear testing. Stockpile stewardship must now be based on more exacting science instead of verification by nuclear tests. Stockpile stewardship also requires that the nation retains the capability to respond to a variety of uncertain futures.

Reducing the nuclear danger will require *stockpile support*—providing the capabilities ranging from dismantlement to reconstituting manufacturing if some of the weapons need to be remanufactured in the future. Much of the stockpile surveillance, dismantlement, and manufacturing technological expertise will eventually reside only at the laboratories.

Reducing the nuclear danger will require *nuclear materials management*—assuring the availability or safe disposition of plutonium, highly-enriched uranium and tritium. It is currently projected that a new supply of tritium will be needed around the year 2010. No need for new plutonium or uranium is anticipated in the foreseeable future. The principal concern is one of safe disposition. Currently, many hundreds of tons of these materials exist not only in returned warheads, but also as production scrap, residues, or nuclear waste. We are particularly concerned about the disposition of these materials in the former Soviet Union where these weapons-grade materials represent a significant proliferation danger.

Reducing the nuclear danger will require *the development of effective non-proliferation and counter-proliferation technologies*. We must keep nuclear weapons, nuclear materials and nuclear weapons knowledge out of the wrong hands. The proliferation threat poses the most significant risk to our national security today. The defense laboratories are applying their skills to develop technologies for nonproliferation (keeping the materials out of the wrong hands) and counterproliferation (responding to the proliferation threat).

Reducing the nuclear danger also will require that we *clean up the legacy of 50 years of weapons production*. As the global military threat recedes it is imperative that we turn our attention and technical talents to remediating the environmental problems in the defense complexes of the United States and the former Soviet Union.

Los Alamos is well positioned to serve the nation in this new world. Of the seven nuclear systems that will remain in the U.S. nuclear arsenal after the turn of the century, Los Alamos designed and engineered five. However, the scientific challenge of ensuring the stockpile beyond its design lifetime is greater than was the challenge of designing new weapons. At Los Alamos, we have the most complete set of facilities to help support the stockpile of tomorrow. We have a history of technical accomplishments and facilities to help manage the nuclear materials and we have turned our considerable expertise in chemistry, engineering, and life science to addressing the daunting environmental problems of the production complex. We are working closely with Livermore and Sandia laboratories to provide the nation with the best technologies to prevent and respond to the proliferation of weapons of mass destruction. Los Alamos also has made significant progress in developing a cooperative working relationship with its counterpart laboratories in Russia to address world-wide proliferation concerns.

So, *reducing the nuclear danger* will be a compelling central mission for Los Alamos for the foreseeable future. This mission will require that we keep excellent, experienced people committed to these challenges. We also will require continued excellence in several core technical competencies.

Great Science

The great strength of our Laboratory is the quality of the science and technology it applies to its mission. Indeed, the Laboratory's identity and international recognition rests upon its sustained performance in satisfying national needs in science and technology. For its entire existence, the Laboratory has been large enough, with sufficient resources and depth, to carry out its responsibilities. It has also been, at least until recently, stable. People hire on for a career, not just a job. They may come for the challenge of basic research, knowing little of the challenges of our defense missions, but they stay for the continuing intellectual stimulation that comes from contributing to a diverse program mix.

It is no coincidence that Los Alamos is embedded within a major research university. Association with the University of California not only assists us in recruiting the best talent available, it reminds us that science and excellence must be our highest priorities. We can take the long-term view of a government laboratory, yet we have the talent and reputation that allow us to move rapidly into emerging areas of science and technology.

For this Laboratory to perform its defense missions, the strength and reputation of its scientific and technical capabilities must be maintained. The challenge of assuring a safe and secure nuclear deterrent, particularly in the absence of nuclear testing, requires a diverse scientific and technical environment. In a stringent budget climate this entails access to skills and technologies beyond those that can be supported solely for the national security mission. Programs now supported by other Department of Energy offices such as the Office of Energy Research, as well as work for other federal agencies, particularly the Department of Defense, help support necessary capabilities. Further, maintenance of the quality of the Laboratory's work requires that the Laboratory's scientists be integrated into the broader scientific and technical community.

Therefore, I am concerned that we may find it difficult to maintain the competencies necessary for the performance of our core defense mission if that mission is interpreted too narrowly. Basic research, exemplified by the first detection of the neutrino by a Los Alamos team in 1956 and our recent research on the mass of the neutrino, is essential to our defense mission. Research using spallation neutrons at the Los Alamos Neutron Scattering Center (LANSCE) in materials will support the defense mission as well, leading to greater understanding of stockpile stewardship issues, new means for tritium production, and perhaps to new ways to rid the nation and the world of long-lived radioactive wastes. The multiprogram nature of our Laboratory must be maintained if we are to continue to perform, much less excel, in our defense mission.

The Galvin Task Force Report

The task force report is the result of a thorough examination of the laboratories. This examination encouraged the laboratories to examine themselves in new ways. In fact, one of the positive outcomes of the process of the task force is that the laboratory directors now communicate and coordinate their activities more closely than ever before. I view the report of the task force more as a beginning, than an end. The report will be one of several inputs to the White House National Science and Technology Council as it considers the future of the major federal laboratories this spring. As indicated by this hearing, Congress is also keenly interested in following up on the report because it deals with programs, budgets, and governance—all areas of great interest to the Congress. Nevertheless, I will reserve my comments on the report primarily to those that directly concern Los Alamos.

We find strong support in the report for the Los Alamos core mission of reducing the global nuclear danger. The task force strongly endorses the need for science-based stockpile stewardship in the absence of underground nuclear testing. Specifically endorsed are the needs to attract and retain skilled scientists and engineers; to enhance surveillance of weapons; to re-analyze previous test data by using advanced numerical simulations; to sustain the scientific process of inquiry through experimentation; to support the Dual Axis Radiographic Hydrotest facility (DARHT) to continue hydrodynamic testing; to utilize LANSCE for neutron radiography; and to support research programs such as advanced computing and accelerator concepts for producing tritium. In addition, the report is consistent with our laboratory playing a strong role in nonproliferation and counterproliferation, the safe tracking and disposition of fissionable materials, and cleaning up the legacy of 50 years of nuclear weapons production.

The task force finds that "basic research is necessary to support their core missions ... that it is necessary to attract the most talented people to the laboratories." The report expresses concern over what appears to have been a significant decline in Departmental funding for fundamental research over the past three years. I share this concern as I expressed above.

The task force is also supportive of the Department's missions in energy and environment. The report states—"there is a long list of exciting, challenging, and vital areas of research and technology development that constitute the appropriate energy agenda for the laboratories." The task force calls for greater attention to the energy mission by the laboratories in conjunction with collaboration with the private sector. It specifically calls out a need to support industrial ecology: the interplay of energy, raw materials, environment and economic development. We must demonstrate how Los Alamos can make very special contributions to the nation's civilian agenda because of the strengths and synergism arising from our defense mission.

On the matter of working with industry, the task force provides some cautions to avoid making economic competitiveness a principal mission of the laboratories. I agree with many of the concerns of the task force, however, I want to caution Congress not to indiscriminately cut back the laboratories' industrial collaborations. At Los Alamos, I view working with industry not as an option but a business necessity. Working with industry allows us to stay sharp technically and to provide leverage for the federal research investment in our programs and institutions.

The task force was also asked specifically to address the size of the laboratories. It does not recommend closure of any laboratories. However, it rejects some of the current arguments for the need for two competing nuclear design laboratories, calling for consolidation of key nuclear weapons functions at Los Alamos over the next five years. These recommendations will have to be reconciled with the Department's Defense Programs vision and roadmap of the future weapons complex.

The task force also stated that it "believes that the national laboratory system is oversized for its current mission assignments." Several contributing factors are mentioned, including current management inefficiencies at the labs and the Department, excess capacity associated with nuclear weapons, and politics that make it difficult to downsize or restructure. Although I certainly agree that improvements in governance and a sharpened mission focus for the laboratories will yield significant productivity improvements and will allow for somewhat smaller laboratories, along with significantly fewer government oversight personnel, it is critical that we focus first on function and then on size. The 10 laboratories reviewed by the task force currently constitute approximately one-third of the Department's budget. It is imperative that the Department develop its missions and the roadmaps to accomplish those missions and then size the laboratories accordingly.

For example, the current Defense Programs vision and roadmap anticipates a smaller, less costly overall defense complex in the future. However, to achieve this vision the defense labs would have to assume additional tasks within the overall complex. The Department should develop similar roadmaps for energy and environment, cleanup, and science. In addition, work for other government agencies must be strategically incorporated to provide the proper synergy with the Department's missions. Congress can help by encouraging the Department of Energy to take this approach to effectively size the laboratory system.

The report leaves little to the imagination on the subject of DOE's oversight and management of the laboratories with the statement—"the current system of governance of these laboratories is broken and should be replaced with a bold alternative." I applaud taking a fresh look at the governance of the laboratories. Over the years the laboratories have been pushed toward *the federal norm* in many of their business and operational practices, consequently losing much of the flexibility and independence that were the hallmarks of the GOCO (government-owned, contractor-operated) system of governance.

The corporatization model proposed by the task force has certain initial appeal. However, the versions I have examined so far do not appear as attractive as fixing the GOCO system. The major changes outlined in Appendix B of the report aimed at fixing the GOCO system would go a long way to remedy what the task force saw as "operational inefficiencies and demotivational consequences" of excessive oversight and micromanagement.

I am very encouraged by the Department's response (as outlined in Secretary O'Leary's testimony to the Senate Committee on Appropriations on February 28) in addressing the governance and oversight issues. Such actions, along with developing specific roadmaps for the civilian and science missions of the Department would greatly enhance the value of the Department and its laboratories to the nation. I urge strong congressional support for such actions.

As to what the laboratories can do, we must continue to improve our operations and business practices. The standards that the Galvin Task Force have in mind are not necessarily less severe than those practiced now. We must be scrupulous in protecting the health and safety of our employees and the public. We must comply with federal and state laws and regulations. We must demonstrate responsible fiscal and property management. Management improvements would be targeted to focus on effectiveness and product, not on administrative process. We must continue to benchmark our operations and practices against the best in class. Only then can we hope for a world with fewer audits and greater flexibility. Further, we must continue to work together more cooperatively as a *system* of laboratories, teaming as appropriate with universities and industry to meet the science and technology needs of the nation.

To sum it up, the task force makes some excellent recommendations on how the Department of Energy and the laboratories can enhance their contributions to the nation. I view it as a positive beginning for the next phase—making it all happen.

STATEMENT OF DR. ALBERT NARATH, PRESIDENT, SANDIA NATIONAL LABORATORIES

Dr. NARATH. I would give the same response.

[The prepared statement of Dr. Narath follows:]

Statement of Albert Narath, Director
Sandia National Laboratories

United States House of Representatives
Committee on Science
Subcommittee on Basic Research
Subcommittee on Energy and Environment

Hearing on *"Alternative Futures for the Department of Energy National Laboratories"*
(Galvin Report)
and
"National Laboratories Need Clearer Missions and Better Management"
(GAO Report)

March 9, 1995

Sandia National Laboratories

". . . exceptional service in the national interest"

Statement of Albert Narath, Director
Sandia National Laboratories

United States House of Representatives
Committee on Science
Subcommittee on Basic Research
Subcommittee on Energy and Environment

Hearing on *"Alternative Futures for the Department of Energy National Laboratories"*
(Galvin Report)
and
"National Laboratories Need Clearer Missions and Better Management"
(GAO Report)

March 9, 1995

1. Introduction

Chairman Schiff, Chairman Rohrabacher, and distinguished members of the subcommittees, I am Al Narath, director of Sandia National Laboratories of the Department of Energy (DOE). Sandia National Laboratories is managed by Sandia Corporation, a wholly owned subsidiary of Martin Marietta Corporation. Sandia performs scientific and engineering research and technology development in support of DOE's missions in defense, energy, environment, and the basic sciences.

I welcome this opportunity to share with you my views on the findings and recommendations of the two reports under consideration at this hearing: *"Alternative Futures for the Department of Energy National Laboratories"* (the Galvin report) and *"National Laboratories Need Clearer Missions and Better Management"* (a GAO report). These two studies have much in common, but they also differ in significant areas. In general, the Galvin report is bolder in its recommendations, although the GAO review is no less critical in its findings.

At the outset, I would like to commend the members of the Galvin group, the Secretary of Energy's Task Force on Alternative Futures for the DOE National Laboratories. I know they worked very hard to produce a scrupulously independent study that would challenge the status quo. In my opinion, they have performed an outstanding public service. I would also like to acknowledge the contributions of the distinguished panel of energy experts consulted by GAO during their review.

I will begin my remarks by describing Sandia's strategic vision. It is a vision that is in essential harmony with that of the Galvin Task Force. I will then address the concerns of both reports in three principal areas: DOE laboratory missions, DOE laboratory collaborations with industry and universities, and DOE laboratory governance.

Sandia National Laboratories' Strategic Vision

Sandia's *Strategic Plan 1994* outlines a conceptual framework for mapping all levels of the research and development cycle to our mission responsibilities. This strategic plan complies with the guidance of the DOE strategic plan, and I believe it defines appropriately our particular capabilities and fields of contribution as a member of a DOE laboratory system.

At the core of its diverse mission responsibilities lies Sandia's enduring stewardship role in the nation's nuclear-weapon program. Today and into the foreseeable future, Sandia's ability to execute this mission will depend on maintaining a strong, integrated technical foundation, represented most fundamentally by our core competencies. A world-class base of scientific and technological excellence has always been the critical factor in meeting the extreme requirements placed on nuclear weapons, especially in regard to weapon safety, security, and reliability. These are areas of major Sandia responsibility. Our ability to sustain this technical base has been made difficult over the years by a decline in weapon R&D funding that began as early as 1965 and has persisted since then with few reversals. Today, the ability of the nuclear-weapon program to preserve and strengthen Sandia's essential technical foundations stands at an all-time low. For the past twenty years, our approach to dealing with this problem has been based on a strategy of program diversification. A strong commitment to a common set of core competencies serving the needs of, and being supported by, a diverse spectrum of customers has become a unifying element in Sandia's existence. It has been a critical factor in our ability to support DOE's national security mission. It has also been a critical factor in our ability to support DOE's missions in energy, the environment, and the basic sciences.

The science and technology needs that characterize DOE's nuclear-weapon mission are extremely broad, covering most of the physical sciences and engineering disciplines recognized today, as well as the computational and supporting technologies required for modern scientific investigation. Consistent with Sandia's role in the weapon program, our core competencies derive from a matrix of scientific and integrated technological initiatives that are most generally described by the term, "science-based engineering." Sandia's scientific research is focused on materials, microelectronics and photonics, computational and information sciences, and engineering sciences. Sandia's principal integrated technological initiatives—advanced manufacturing technology, electronics technology, advanced information technology, and pulsed power technology—are firmly rooted in our scientific foundations and derive their value from an uncompromising mission focus. We commonly refer to these initiatives as "strategic initiatives," because they are technologies of vital importance to DOE's future missions success.

Taken collectively, these activities comprise a tightly integrated body of technical work in which it is difficult to distinguish between "basic research", "applied research', technology development", etc. Moreover, such distinctions serve little useful purpose in a multiprogram R&D environment.

A critically important element of Sandia's strategy is a strong commitment to R&D partnerships with industry and universities as a way to increase the rate of progress in satisfying DOE's mission needs. Sandia's success in establishing large numbers of mutually beneficial relationships with the private sector is in large measure a consequence of Sandia's core competencies being well aligned with private-sector interests.

DOE Laboratory Missions

A principal message of the Galvin report is that the DOE laboratories should concentrate on their traditional mission areas and resist the temptation to search for new missions outside those areas. The report goes on to observe that it is ironic that the labs would feel a need to search for new missions when *"there remains a compelling agenda of important work to be performed in their traditional mission areas"* (page 5). I concur with this conclusion. The challenges remaining in DOE's traditional mission areas are indeed formidable and leave a lot of room for important technical work in the national interest.

There is, of course, validity to the observation that the national laboratories have sought to diversify their missions. In most, if not all, such cases the underlying reasons are defensible. In the 1970s such a strategy was used by the three Defense Program laboratories, with the blessing of the Congress, to help maintain their critical capabilities after a decline in weapon-related work that was similar in severity to what we are experiencing today. The laboratories diversified into energy research and development, and Congress incorporated them into the newly created Department of Energy. The history of this diversification is outlined on page 11 of the GAO report.

The GAO report states that similar mission diversification occurred in the 1990s: *"The weapons laboratories, facing reduced funding in nuclear weapons research, have diversified their work in order to maintain their preeminent talent and facilities."* While I believe this finding overstates the extent of additional diversification that has actually been achieved, it at least puts the motive for diversification in its proper light. Laboratory managers have always been concerned about their ability to preserve the technical competencies required to perform DOE missions. Supplemental support of those competencies from other mission areas was seen as an appropriate and precedented strategy.

Both Galvin and GAO reject industrial competitiveness as a primary mission of the DOE laboratories. However, both support laboratory-industry collaboration when it is derivative of DOE mission work. This position is clearly articulated in the Task Force report (page 7):

> *Collaborations between the national laboratories and the private sector serve the important function of providing dual benefits to the partners, but such collaborations generally should be closely aligned with core mission areas of the Department.*

Contributions to industrial competitiveness—working collaboratively with U.S. industry to develop new technologies with commercial potential—has long been identified as an important laboratory activity by the Congress, most recently by the *National Competitiveness Technology Transfer Act* (NCTTA) of 1989. Although seen initially by many as a new mission mandate for DOE, the NCTTA legislation included language that placed a "dual-benefit" constraint on Cooperative R&D Agreements (CRADA). This constraint need not be a serious impediment to private-sector collaborations. It has become quite clear in recent years that greater interaction with industry is essential to the long-term success of DOE as it reconfigures its nuclear weapons complex and pursues its energy, environmental, and basic-science responsibilities. There should be no misunderstanding that such collaboration is essential to the laboratories' ability to accomplish their DOE missions now and in the future. I will discuss Sandia's strategy for conducting collaborative work in accordance with the guidelines of the Galvin Task Force later in this statement.

I am puzzled by the statement in the GAO report that *"DOE's laboratories do not have clearly defined missions"* (page 2). I have difficulty understanding the report's claim that *"laboratory managers frequently made comments to us such as, 'we don't really have a mission'"* (page 17). It seems self-evident to me that the laboratories' mission, collectively, is to support DOE's mission objectives. The Galvin report quite properly enumerates the DOE laboratories' established missions as *"national security, energy, and environmental science and technology, as well as . . . the fields of fundamental science which underpin these missions"* (page 4). Whether the assignment of work among the laboratories is currently optimum, given the fact that no two laboratories have exactly the same capabilities, could, of course, be debated.

At Sandia, our mission focus remains sharp. It is articulated in summary form in our *Strategic Plan 1994:*

> *As a Department of Energy national laboratory, Sandia works in partnership with universities and industry to enhance the security, prosperity, and well-being of the nation. We provide scientific and engineering solutions to meet national needs in nuclear weapons and related defense systems, energy security, and environmental integrity, and to address emerging national challenges for both government and industry.*

Although the Sandia mission statement might appear too open-ended to meet the Galvin strictures, our focus on mission-defined core competencies gives assurance that Sandia is not likely to stray too far.

The GAO panel is quite concerned that the missions of the DOE laboratories do not seem to be clearly differentiated from one laboratory to another. This criticism is echoed in Galvin. Both reports urge DOE to assign laboratory missions with greater specificity. GAO suggests that the format of a laboratory mission statement be *"a coordinated set of objectives with specific implementation strategies . . ."* (page 3). I believe that goes too far. Mission statements should not specify programmatic objectives and implementation strategies. To do so will exacerbate the micromanagement problem that has been so strongly criticized by both GAO and Galvin. Mission assignments should express a strategic intent. There remains much room for differentiation among the missions of individual laboratories without getting into program objectives and implementation strategies. Such differentiation already exists in many cases, especially among the so-called program-dedicated laboratories. To a lesser extent, it can also be found among the multiprogram laboratories. For example, while there are three laboratories that support DOE's nuclear weapons program, Sandia's responsibilities are clearly differentiated from those of its sister laboratories.

One should be careful that greater mission differentiation among the DOE laboratories does not lead away from the multiprogram concept toward single-mission laboratories. The multiprogram, multidisciplinary environment is absolutely essential for excellence in most of DOE's missions. The synergy that exists in a multiprogram environment enhances mission performance. The Galvin report is sensitive to this issue (page 23):

> *The Task Force recognizes that there are important and practical limitations on how narrow one can be in delineating missions for multi-program laboratories which exhibit vast breadth both in technical expertise and programmatic activities, and whose uniqueness in large degree derives from an ability to support complex, multi-disciplinary R&D activities.*

Consequently, one should not be surprised that more than one DOE laboratory is involved in a given DOE mission. Nor should one be surprised that several laboratories require the same or similar technical competencies. What seems important to me is that the laboratories cooperate with each other more effectively for mission success. By working towards a "system of laboratories" DOE can best take advantage of the great diversity of its laboratories. Both Galvin and GAO encourage lead laboratories and centers of excellence to produce inter-laboratory coordination in mission areas. I support those concepts.

DOE Laboratory Collaborations With Industry and Universities

The GAO panel believes that *"a commercial technology mission for the laboratories is legitimate and important"* (page 31). Like Galvin, it believes that this activity should occur within established DOE missions and not become a central, stand-alone mission. Galvin strongly supports laboratory collaboration with industries and universities within traditional DOE mission areas. The Galvin report gives several examples of appropriate collaboration leading to commercial applications:

- *For firms and industries that are contributing to DOE's traditional mission objectives, the national laboratories have a useful role in carrying out long-term research and development with potential commercial applications. Indeed, it is even possible to imagine the laboratories playing a role with respect to these industries comparable to that which used to be played by central corporate research laboratories.* (pages 47–48)

- *The Department currently has several major collaborations in place with the Gas Research Institute, Electric Power Research Institute, fossil fuel extraction companies, and energy-intensive industrial sectors, such as the pulp and paper industry. The Task Force commends these efforts, which help guide appropriate areas of government vs. private sector R&D, and help ensure eventual commercialization of new technologies and processes.* (page 21)

- *In general, the Task Force believes that the energy mission is of extreme importance and deserves greater attention by the national laboratories, working in collaboration with the private sector.* (page 20)

- *The Department should continue and expand R&D partnership efforts between the laboratories and resource-intensive industries, utilizing the concept of industrial ecology as a method for deriving outcomes that contribute to sustainable economic development.* (pages 25–26)

- *To the maximum extent possible, energy R&D at the laboratories should be coordinated with the private sector and be guided by technology road maps.* (page 6)

A casual reading of the Galvin report might lead one to conclude that the Task Force is ambivalent in its recommendations concerning laboratory-industry interactions: It rejects a primary mission for the laboratories in industrial competitiveness; yet it strongly encourages collaborative activities when they support core DOE missions, as illustrated by these examples. The distinction is explicated at some length in chapter VI of the report and is well worth study. The point to be emphasized here is that designating industrial competitiveness as a derivative mission in no way diminishes its importance to DOE and to the nation.

However, in my view, the Galvin analysis at this point appears too limiting in one important respect. The Task Force evaluates the potential utility of collaborative R&D based on whether the collaborating industry is within or outside traditional DOE mission areas. It seems to me that a more appropriate criterion is whether the technology (not the industry) falls within or outside the core technical competencies required for DOE missions. From a DOE perspective, a key factor in developing industrial relationships should be the potential contribution of the collaboration to advancing mission-critical technologies. For example, the tire industry may seem to have little in common with DOE missions. However, improving an engineering tool for solving structural mechanics problems common to both tire design and the design of certain nuclear-weapon components should be an appropriate field for collaborative R&D.

In fact, Sandia has been collaborating with Goodyear Tire and Rubber Company on such a problem. The company has benefited from access to modeling and simulation codes and experimental techniques developed in the weapons program; DOE has benefited from substantial improvements in those codes resulting from the industrial interaction. The improved computer codes will be used to solve weapon component design problems that previously were intractable.

Another example is Sandia's collaborative work with the University of New Mexico medical school to develop a non-invasive blood glucose sensor for diabetics. While biomedical products and devices clearly fall outside DOE's traditional mission areas, some of the enabling technologies are strongly represented in DOE missions. Infrared spectroscopy and statistical techniques for processing spectral data are important skills for DOE missions. They are essential for the study of gas evolution within solids and combustion phenomena that are encountered in the nuclear-weapons program and several energy and environmental programs. These skills, resident at the laboratories, made development of the glucose sensor possible.

Thus it is not sufficient that the laboratories clearly define their DOE missions; it is also essential that they identify the core technical capabilities needed to perform those missions. Collaborative work with industry and universities should relate to DOE missions through the technologies being exercised, not only through the end products of the collaboration.

The Galvin report charges that *"taken as a whole, industrial competitiveness activities at the national laboratories are unfocused and lack a firm policy foundation"* (page 45). Speaking for Sandia, I can demonstrate that our industrial competitiveness activities do indeed rest upon a firm policy foundation and are focused on explicitly defined strategic technological initiatives. That policy foundation is laid out in our 1994 strategic plan in a strategic objective concerning industrial competitiveness. The policy is to seek strategic alliances with industry, universities, and other laboratories to pursue research objectives that are mutually beneficial to the sponsoring DOE program and the industrial partner. Such alliances benefit Sandia by permitting us to incorporate the most current commercial technologies into DOE products. They benefit industry by enabling the development of new or improved products and services based on the latest technological developments. Sandia's core competencies provide unifying points of focus for our collaborative work and technology transfer. I believe this policy is consistent with the recommendations of the Galvin Task Force.

In the future, cooperative research and development agreements (CRADAs) will increasingly be funded from direct programs rather than technology transfer set-asides. In order to facilitate industrial collaborations with funded DOE programs, our technology transfer organization has been reorganized to support Sandia's program managers in developing collaborations with industry and universities. Specifically, we seek collaborations with companies or industrial consortia that address the crosscutting goals of the Laboratories' scientific and technological strategic initiatives.

Industrial Benefit

The Galvin Task Force expresses skepticism that the DOE laboratories can provide substantial technical benefit to industry or that the benefit they provide is unique (page 45):

> *The laboratories are not now, nor will they become, cornucopias of relevant technology for a broad range of industries. A significant fraction of the laboratories' industrial competitiveness activities concern technologies which are of less than primary importance to their industrial collaborators and/or which these partners could obtain from other sources.*

There undoubtedly exist many examples that support this finding. On balance, however, the record suggests a more positive conclusion. Many technical advances originating in the DOE laboratories have had a profound impact on whole industries. For example, the supercomputer industry was born in the nuclear-weapons program. The vertical laminar-flow clean room was invented at Sandia and contributed to the growth of the commercial semiconductor industry. In the 1970s we worked with industry to develop synthetic diamond drill bits that gave new life to a troubled industry. The solar energy industry in this country, which enjoys a substantial export market, was enabled by research and development in the national laboratories. Today, an entirely new industry employing pulsed power accelerators for a variety of commercial applications —destroying chemical wastes, hardening metals, joining dissimilar materials, sealing ceramic surfaces, and electronically destroying food pathogens, for example—may develop as the result of collaboration between the DOE national laboratories and the private sector. Development of an industrial base in this processing technology (for which the term "*Quantum Manufacturing*" has been coined) will support Sandia's strategic DOE mission responsibilities.

Indeed, the DOE laboratories are the source of hundreds of technical advances that have proved to be highly relevant to a broad range of industrial needs. Non-CFC cleaning processes, fluxless soldering, reliability testers for semiconductor fabrication, robotic manufacturing processes, chemical dynamics software for controlling industrial chemical processes, advanced welding techniques, diagnostic devices for combustion chambers, rapid prototyping techniques—and on and on. It could be argued that the sheer volume and diversity of such examples at Sandia and the other DOE national laboratories makes the word "*cornucopia*" not as great a stretch as might appear at first glance.

Not only have the national laboratories provided useful technology to industry, the volume of such technology transfer is expanding steadily, and industry is footing more of the bill. In 1991, industry contributed 50 percent of the cost of cooperative research and development at Sandia. By 1994, that figure had risen to 76 percent. At the same time, "funds in" arrangements are becoming more common. During the past year approximately 20 percent of Sandia's work in support of industrial collaborations was industry funded. This trend is evidence that industry believes it is getting something of value from its collaborative work with a national laboratory.

Another reason for this trend—and a very unfortunate one—is that long-range industrial R&D has declined during the last decade. Many companies have down-sized or eliminated their research laboratories. Thus, the pool of "other sources" referred to in the Galvin passage quoted above has diminished significantly. Clearly, in today's market there is no possibility for industry to support R&D enterprises as broadly based as the DOE laboratories.

Large-Scale Strategic Alliances

Sandia's strategy for technology transfer has evolved from maximizing the number of small CRADAs to seeking large-scale precompetitive alliances with industry and universities. In the last two years, we have begun to focus on teaming arrangements with clusters of companies and larger-scale alliances in which the capabilities of DOE laboratories, industry, and universities are combined to pursue mutually compatible R&D interests. Many of our newer cooperative projects involve clusters of companies representing a substantial segment of a specific industry, or involve working with organizations that represent an entire industry. I believe this strategy complies with the Galvin model for networked research and development, with

> *. . . the laboratories serving as nodes in a national network of research and development institutions, with knowledge flowing in both directions along the links between the laboratory, university, and firm nodes. This network is simultaneously pursuing fundamental knowledge for its own sake, innovation for the purposes of private wealth creation, and public missions (national defense, public health, environmental quality, etc.) . . .* (page 46)

For example, we are working with a cluster of companies under a cooperative R&D agreement with MacNeal Schwendler Corp., PDA Engineering, Fluid Dynamics International, Goodyear Tire & Rubber Company, and Ford Motor Company to develop three-dimensional mesh-generation software to shorten the cycle time for developing production prototypes. This consortium is conducting precompetitive generic research that will benefit the entire industry. It is also enhancing Sandia's strategic initiatives in advanced manufacturing and advanced information technology, core competencies that are critical to the nuclear weapons program for designing electrical and electromechanical components. Each industry participant will use the software to develop a commercial product or service in the area of computer-aided engineering or in applications for finite element analysis—a powerful numerical method useful in many industrial engineering applications, including structural mechanics, electrical engineering, and fluid mechanics.

Fastcast Consortium, Inc., is a group of seventeen companies that have banded together with Sandia to advance the state of the art in investment casting. Member companies range in size from giant Ford Motor Company to tiny Trucast (a five-man outfit in Louisville, Kentucky). Sandia National Laboratories uses investment casting to provide lightweight, high-strength housings for electrical assemblies in nuclear weapons. Advances by Sandia and the consortium include computer software that allows engineers at different locations to work on a casting design simultaneously; computer programs that predict how molten metal will flow into a mold (for use in mold design); mesh-generation and finite element codes that predict casting performance; and selective laser sintering and stereolithographic techniques that produce solid models of castings for use in rapid prototyping. Sandia has identified one of the consortium companies as a possible supplier of weapon housings.

In another collaborative research program, Sandia's strategic initiative in advanced manufacturing technology is again strengthened. We are working with the strategically important U.S. specialty metals industry to improve the technology base for melting processes used in manufacturing specialty metals. Specialty metals, such as high-performance steel and titanium or nickel-based alloys, are critical to American economic competitiveness in areas ranging from microelectronics to airplanes and are also vital to national security. The consortium has conducted several major investigations. Most of the research has taken place within Sandia's Melting and Solidification Laboratory complex, which features the only large-scale, fully instrumented research furnace in the country. Research is enabling and generic in nature so that each member company can develop its own proprietary processes and products. Patents resulting from this work will be made available to consortium members through a royalty-free licensing arrangement.

Sandia's strategic initiative in electronics technology relies heavily on collaborative interactions with the semiconductor industry. Industry participants include such major firms as Intel, IBM, AT&T, Hewlett Packard, National Semiconductor, Signetics, and Texas Instruments. A five-year CRADA with SEMATECH, which is itself a consortium, is aimed at developing improved semiconductor manufacturing technologies for the next generation of integrated circuits, including equipment that reduces manufacturing costs while increasing yield. This CRADA builds on a relationship established with SEMATECH in 1989 when Sandia's Semiconductor Equipment Technology Center was formed. It also extends a 1992 agreement that established the Contamination-Free Manufacturing Research Center at Sandia to study ways to reduce trace levels of contamination in semiconductor manufacturing, a critical problem facing microelectronics manufacturers. These collaborations help Sandia advance its strategic initiative in electronics technology, which is an exceedingly important core competency for the DOE national security mission.

DOE User Facilities

Another facet of DOE's strategy for industrial collaboration and technology transfer is the designation of user facilities at the national laboratories for cooperative research and development by and with industry users. The Galvin report acknowledges the contributions of DOE user facilities in the context of fundamental research (page 6):

> *Such contributions often have derived from large-scale scientific user facilities that have been built and operated at the national laboratories (as well as at the Department's program-dedicated laboratories). Such facilities have enabled government, academic, and industrial researchers to explore scientific frontiers that have not been accessible in other ways. Long-term, fundamental research of this form has been part of the national endeavor to create a better future through investments which could have a transforming, yet unknowable impact on society.*

Sandia's user facilities perform substantial scientific and engineering research that is of value both to industry and DOE.

One of the oldest and most successful of DOE's user facilities is the Combustion Research Facility (CRF) at Sandia's laboratory location in Livermore, California. The facility was established back in the 1970s expressly to preserve an essential core competency of the nuclear weapons program by expanding the user base for those skills. The CRF made use of Sandia's leading-edge capability in laser diagnostics, which had been developed for use in the nuclear-weapons program. During the last twenty years, the facility has been one of the most consistently successful examples of collaborative research involving a national laboratory, industry, and academia. The facility uses cooperative working groups to optimize collaboration among industrial, university, and national laboratory participants. Industry partners in these working groups have included General Motors, Ford Motor Company, Chrysler, Cummins Engine Company, Exxon, Navistar, Unocal, GRI, AGA, and Lennox Industries, as well as small companies.

The Combustion Research Facility provides substantial technology transfer to small and medium-sized businesses as well. For example, an instrumented head gasket for studying the combustion process in production engines was developed in response to direct inquiries from industry. The gasket, which earned an R&D 100 Award, incorporates ionization probes that detect the position of the flame in the cylinder, permitting measurement of combustion uniformity in an engine under development. The technology for this diagnostic gasket was transferred to DSP Technology, Inc. of Fremont, California, a small business, which now manufactures it.

The Combustion Research Facility has been in need of a substantial improvement in laboratory, office, and computing infrastructure for some time. We are encouraged by the Administration's FY 1996 budget request, which specifies funding to begin the needed Combustion Research Facility Phase II construction.

Today, Sandia has many user facilities and technology centers that are performing dual-benefit collaborative work with industry and universities. The appendix to this statement provides a listing and description of the research centers and user facilities at Sandia that represent core technical capabilities for DOE missions and that are available for collaborative technology development with industry and universities. The research and technology development activities conducted at these facilities satisfy a broad spectrum of dual-benefit needs for government and industry.

Technical Assistance to Small/Medium-Size Enterprises

The national laboratories have been working hard to provide technical assistance directly to small and medium-sized enterprises. Sandia, Lawrence Livermore, and Los Alamos national laboratories and the Y-12 production facility at Oak Ridge have established a joint Small-Business Technology Transfer Program. This program is a follow-on to the successful National Small-Business Technology Exchange Program. We work with small-business development centers, cooperative extension services, bankers, chambers of commerce, state economic development agencies, and vocational education teachers to identify technology partners. Included in the program are regional, short-term technical assistance programs in New Mexico, California, Arizona, Texas, and the Midwest. Also included are partnerships with industry associations to reach a greater number of small business participants by addressing common problems and opportunities and matching laboratory capabilities with the needs of small businesses.

Technical assistance to small and medium-sized companies increases the return on the federal investment in DOE's technical assets to the taxpaying public at minimal incremental cost. Let me give you an example:

Over a twenty-year period, Sandia developed a world-class program to apply very hard surface coatings to parts for nuclear weapons. The technology, based on super-high-temperature plasma flames, can also produce coatings for superior commercial products as well. Fisher-Barton, a small Wisconsin company that specializes in manufacturing lawn mower blades, recognized the potential for application of this process in several new areas, and recognized that Sandia could facilitate their entry into new markets. Fisher Barton paid the salary for one of their engineering employees to work for a year side-by-side with Sandia scientists; DOE provided a $57,000 award to help defray living expenses and costs for experiments of particular interest to industrial use. (This award was essentially an early form of the now-popular Cooperative

Research and Development Agreement [CRADA]). Fisher Barton gained sufficient experience to launch a new service. Two patents resulted from the joint work of the Fisher-Barton employee and Sandia engineers. In 1994, Fisher-Barton established a new company, Thermal Spray Technologies, in Sun Prairie, Wisconsin.

Here is a summary of the economic costs and benefits of this technology transfer as analyzed by an economist at the University of New Mexico: The Department of Energy invested about \$3.7 million over a twenty-year period to develop this technology for nuclear weapons and other DOE program needs. The incremental cost to the government for supporting the Fisher-Barton effort was only \$57,000. An assessment at the end of 1994 showed that the gross economic benefit to Fisher-Barton, its community, and its customers was already close to \$25 million. The benefit to cost ratio is about 300 to 1. One should also note that additional side benefits have been identified. For example, retention of another company's manufacturing operation for bicycle wheels will be retained in the United States, owing to the special value-added services of Thermal Spray Technologies.

This is an excellent example of how laboratory-industry collaboration in technologies that support established DOE mission requirements can provide great leverage for broad economic benefit.

Technology "Road Maps"

The Galvin report also encourages the development of technology "road maps" for collaborative R&D between the laboratories and industry and universities (page 58).

> *The Task Force suggests that there be a more liberal application of the technique of defining technology roadmaps for those classes of technology which would yield to a roadmap. We urge that this management process be employed where practical. All appropriate constituencies from government, academia, industry and the laboratories who have a competence at contributing to a given roadmap, should be called upon to define such roadmaps in a manner similar to that which has been accomplished by the semiconductor industry.*

Sandia and other DOE national laboratories have been active with major industry trade associations to help develop precompetitive technology strategies or "road maps" that outline technical and business strategies for cooperative research on industry problems. For example, a couple of years ago the Semiconductor Industry Association issued a technology plan for the U.S. microelectronics industry through the year 2013. The plan was assembled by 179 top U.S. semiconductor experts from industry, government, and universities. This road map identified opportunities for the DOE multiprogram laboratories to help industry address their generic technology needs.

In response to the Semiconductor Industry Association's directly stated needs, Sandia established its Center for Microelectronics Technologies to assist the industry in dual-benefit projects. This center was created by combining the existing DOE-funded Microelectronics Development Laboratory at Sandia with a major donation of equipment and research instrumentation from IBM valued at over \$20 million. The center will encourage partnership projects with U.S. microelectronics manufacturers and universities to develop the technologies, manufacturing equipment, and advanced processes upon which the future of both commercial and defense electronics depends. The center also serves as an arena through which U.S. graduate students are trained in the most advanced integrated circuit technologies in the world.

A combined governing board chooses projects that create teams of researchers selected from universities, industry, and the DOE laboratories with major industry partners who agree to commercialize the results. The federal government is a major beneficiary of this joint work, both through the development of custom products for government applications and through support for the domestic manufacturing base that provides these products.

Similarly, the U.S. Optoelectronics Industry Development Association (OIDA) created a technology road map to chart a course for joint action to advance industry opportunities in the emerging optoelectronics market. OIDA selected five critical areas for joint research and development at the precompetitive stage. Two of the critical enablers—optoelectronic materials and optoelectronic manufacturing processes and equipment—are areas in which Sandia has recognized technical leadership. Sandia's Compound Semiconductor Science and Technology Center provides an ideal facility at which cost-leveraged partnerships involving industry, universities, and government researchers can perform the precompetitive development of the design tools, processes, and related production equipment essential for U.S. optoelectronics manufacturers. As with the Semiconductor Industry Association's road map, an advisory board recommends projects that combine teams of researchers from both government and industry laboratories and universities.

These examples of industry/university/DOE laboratory teamwork based on industry-defined road maps are a glimpse into the future of joint-sector collaboration. The benefits accrue to the industry as a whole, and DOE's essential technical competencies are strengthened.

Laboratory Governance

The Galvin Task Force makes a bold recommendation to convert the governance of the DOE laboratories to a new basis. The Task Force believes that the GOCO (government-owned, contractor-operated) concept, the model on which the laboratories have operated for the last fifty years, has been irretrievably weakened through unrestrained growth in government micro-management, rule-making, and oversight, and they discount the department's ability to revitalize it. Only through de-federalization will the laboratories be able to operate with the efficiency and flexibility found in the private sector, in their view. To be more specific, the Galvin report proposes a *"corporatization"* model for operation of DOE's national laboratories, with the possible exception of the three Defense Program laboratories (Chapter VII). It would create a not-for-profit R&D corporation with a Board of Trustees appointed by the President (staggered terms). Congress would provide multi-year block-funding and the corporation would allocate these funds to the laboratories, with DOE functioning as the government sponsor of the corporation and the laboratories. The rationale for such a radical change in governance is based on the belief that, unless something is done to buffer the laboratories from the DOE bureaucracy, the inevitable tendency of bureaucrats to "micromanage" will continue to dominate. Moreover, having a board consisting *"primarily of distinguished scientists and engineers and experienced senior executives from U.S. industry"* would tend to insulate the laboratories from partisan politics and provide a measure of stability.

Such a "clean sheet of paper" approach is well-intentioned and, in principle, offers many advantages. Nonetheless, as proposed, it does not seem to me either practical in the near term nor necessarily sustainable over the long term:

(1) The principal weakness of this governance model is its elimination of a strong linkage between the laboratories and an agency of the executive branch. In the absence of such linkage, the ability of the laboratories (in the role of FFRDCs) to assist DOE in program planning and management would diminish greatly. As a result, the laboratories would likely lose their mission focus.

(2) Changing the laboratories from GOCO to private or semi-private corporations would inevitably change the character of the laboratories in a way that is unpredictable, but probably detrimental. In the likely event that multi-year block funding is not provided, I worry that the laboratories would tend to become R&D job shops for small, discrete projects that lack the unifying initiative of a national mission. The critical mass for large, long-term, high-risk/high-consequence programs might be lost in the process.

(3) At the same time, DOE's value-adding role would suffer. An "arms-length" relationship with the laboratories would encourage the Department, over time, to direct its funds elsewhere. If, in addition, the Defense Programs laboratories were moved to DoD, or elsewhere, DOE would become an agency whose prime function would be to "pass-through" government funding. In either case, the separation between the Energy Research and Defense Programs laboratories is incompatible with DOE's "laboratory system" ideas.

(4) The Board of Trustees is unlikely to be effective in resource allocation and, more generally, in coordinating the R&D activities of the laboratory complex, unless it creates a bureaucracy of its own.

(5) It is also most unlikely that the public would be supportive of the degree of independence from government oversight and control that is envisioned by the model.

I believe a more practical approach to addressing the root problems identified in the Galvin report would be to rejuvenate the GOCO relationship along the lines suggested by Appendix B of the report. In addition, a Laboratory Operating Board should be created, as presently being planned by DOE, which would incorporate many of the features of the Galvin model: distinguished leaders, staggered terms, and so forth. The board would also include senior DOE management along with the outside members, and be chaired by the Under Secretary. I believe that such an approach could achieve the benefits of the Galvin governance recommendations, provided it is embraced by senior management throughout the DOE complex.

I do not share the view of the Task Force that DOE is incapable of revitalizing the GOCO model. To be sure, it will be a challenging task for the Department and its laboratories to succeed in such an undertaking. In the last two years, however, I have seen significant progress in the Department that encourages me to believe that DOE is prepared to make necessary changes in how the laboratories are managed. For example, the Secretary has committed the Department to Total Quality Management as the operating paradigm. Significantly, the Department has begun to implement the actions outlined in Appendix B with dazzling energy and determination.

Many of the benefits of corporatizing the laboratory complex can be achieved by applying the quality management and reengineering tools pioneered by industry. For example, at Sandia we are reengineering our operating and administrative procedures to achieve greater efficiencies and cost savings. We are examining several categories of laboratory processes and making basic changes. We are looking closely at our business systems, site management practices, and operational safety and health practices. We are also redesigning our information and communications infrastructure so that many business and management processes can be automated or streamlined.

In summary, I would advise great caution as you explore the pros and cons of corporatizing the DOE laboratories. With your support, I believe DOE's leadership can do much to restore the health and vigor of the GOCO model. Before embarking on a risky and uncertain course of action, I would look for ways to accommodate the needs of tomorrow using a management approach that has been effective in the past.

Conclusion

The Galvin Task Force report is a bold critique on the roles, missions, and governance of the Department of Energy national laboratories. The recent GAO review on the same topic is also a creditable effort. Both reports contain useful and constructive findings and recommendations concerning the future of the DOE national laboratories.

A common theme in these studies is the importance of mission focus in the DOE laboratories. The technical challenges inherent in DOE's existing missions are formidable. An extremely diverse array of core technical competencies and other capabilities, covering the full spectrum of the science and engineering disciplines, must be maintained at world-class levels if the laboratories are to perform their DOE missions consistently, now and in the future.

The technology bases for government and commercial needs are rapidly converging. I am firmly convinced that collaboration with industry and universities is essential for DOE laboratories' mission success. While mutually beneficial collaboration with individual companies will continue to play a significant role, increasing emphasis should be placed on generic, precompetitive research and development that can be broadly useful for an entire industry. Technical assistance by DOE laboratories to small and medium-sized companies is a responsible way to increase the return on the federal investment in DOE's technical assets to the taxpaying public at minimal incremental cost.

The long-term utility and vitality of the DOE multiprogram laboratories requires that these institutions endure as interdisciplinary research organizations under a coordinated system of laboratories that is responsive to major national technical goals. The governance of the laboratories can best be improved by correcting the insults to the time-proven GOCO contract model. Substantial efficiencies may be realized within the GOCO model through adoption of best business practices and total quality management methods pioneered by the private sector.

APPENDIX

Dual-benefit Research Centers and User Facilities at Sandia National Laboratories

The laboratory centers and user facilities discussed below are focal points for coordinating research and development of applied technologies.

All the centers and facilities are useful mechanisms for technology transfer and are available to industrial organizations and consortia for collaborative research and development. The activities conducted in these facilities satisfy a broad spectrum of dual-benefit needs for government and industry.

Advanced Manufacturing Processes Laboratory

This laboratory, a center for advanced prototype manufacturing housed in a 100,000-square-foot facility at Sandia's New Mexico site, features hybrid microcircuits, thin films, printed circuits, ceramics, plastics, and rapid prototyping capabilities. The laboratory coordinates its activities with the Integrated Manufacturing Technologies Laboratory at Sandia's site in Livermore, California. The laboratory focuses on reliability and quality through understanding and qualification of manufacturing processes. This facility is also a proving ground for custom sensors for manufacturing processes.

Advanced Materials Laboratory

The Advanced Materials Laboratory is a joint government/university/industry facility. The laboratory promotes joint research among Sandia National Laboratories, Los Alamos National Laboratory, the University of New Mexico, and U.S. companies in materials and process research, development, and application, and aids in transferring the resulting technologies to industry.

Aging Aircraft Nondestructive Inspection and Validation Center

This center encourages the development of nondestructive techniques applicable to aircraft structural inspection, validates this technology by assessing its reliability and cost-effectiveness, and provides an interface between the inspection portion of the Federal Aviation Agency's National Aging Aircraft Program and the civil aviation industry.

Center for Contamination-Free Manufacturing

This center was formalized by a cooperative research and development agreement between the U.S. semiconductor industry consortium SEMATECH and Sandia in 1992. The center exploits the unique layout of Sandia's Microelectronics Development Laboratory to verify advanced semiconductor manufacturing concepts and equipment that can reduce contamination, which limits the yield of integrated-circuit manufacturing processes.

Center for Liquid-Metal Processing Technology

This center uses industrial-scale processing equipment to improve liquid-metal processing techniques and associated control methodologies. Current industrial collaborations include work on vacuum arc remelting, electroslag remelting, electron beam melting, investment casting, and thermal spray processing (plasma spray, flame spray, and wire arc spray). Interdisciplinary research is in progress to define process physics, advance equipment technology, provide industrial process monitoring capabilities, develop robust multivariant control methodologies, and establish agile manufacturing capabilities, including rapid prototyping.

Center for Microelectronics Technologies

The capabilities of this center are accessed by industry through a five-year, $100 million cooperative research and development agreement (CRADA) with the U.S. semiconductor industry consortium SEMATECH, as well as through CRADAs with individual companies. Center activities are in conjunction with the Semiconductor Equipment Technology Center and the Contamination-Free Manufacturing Research Center. The Center for Microelectronics Technologies conducts projection x-ray lithography and projection electron-beam lithography programs jointly with industrial partners to develop the next generations of processes and processing equipment. The center is the site for developing environmentally conscious procedures for semiconductor manufacturing.

Combustion Research Facility

The Combustion Research Facility, opened in 1980 at Sandia's laboratory in Livermore, California, is an excellent example of Sandia's commitment to partnerships with industry and universities. This designated DOE user facility is chartered to conduct a broad range of fundamental and applied research and development emphasizing combustion science and technology. Research is conducted in collaboration with visiting scientists and engineers from industry, academia, and federal laboratories. Experimental techniques employ laser-based diagnostics and advanced computational modeling. The Combustion Research Facility's special capabilities are used in such areas as combustion science, environmental remote sensing, waste processing, and materials processing. Novel sensors and computational models from the programs are in active use in major U.S. industries.

Compound Semiconductor Research Laboratory

This facility encompasses the full range of activities required to develop the next generation of compound semiconductor electronic and optoelectronic devices. Facilities include extensive molecular beam epitaxy and metal-organic, chemical-vapor-deposition crystal-growth capabilities, ion implantation, and e-beam lithography in a 6,000-square-foot, Class-100 clean room with state-of-the-art processing equipment.

Environmentally Conscious Process Center

This center develops cost-effective processes for reducing wastes and improving energy efficiency in manufacturing processes. It promotes the idea that designers, process engineers, and materials engineers must be included in a cradle-to-grave, totally integrated systems approach to all phases of advanced manufacturing.

Center activity is focused on the following: life-cycle analysis; solvent and chemical substitutes; soldering (including lead-free solders); cleaning technologies; electroplating and surface finishing; sensors for environmental monitoring, reliability and cost/benefit/risk analysis; alternative polymers and foams; vendor compliance; small-business outreach; and dismantlement, recycling, and reuse. Industrial sectors of particular interest include automobiles, electronics, chemicals, and textiles.

The center's future is in three key areas: creating a user facility to demonstrate improved life-cycle environmental designs; prototyping a demonstration facility for the integrated design and production of "green" printed wiring boards; and developing an education, training, and industry outreach program for environmentally conscious manufacturing processes.

Integrated Manufacturing Technologies Laboratories

These laboratories comprise an interdisciplinary mix of equipment and personnel to develop and integrate technologies for advanced manufacturing. Activities include materials and process research and development, process simulation, engineering design, and manufacturing technology support. Within the 90,000-square-foot facility, significant space is dedicated to prototype fabrication research and a demonstration area for agile manufacturing.

During the start-up phase, the focus has been on projection x-ray lithography, welding, precision machining, metrology, and composites fabrication. These activities will be supported by high-speed fiber-optic communications and on-line monitoring and control systems. Flagship programs include SMARTWELD (an integration of modeling, simulation, and sensors with actual welding processes to allow fabrication of critical components without extensive development time and costs) and soft x-ray projection lithography, where a laboratory-based machine will be scaled-up to demonstrate integrated circuit fabrication at submicron line widths.

Intelligent Systems and Robotics Center

This facility is a fully integrated research-to-development-to-application center that provides technologies for intelligent and agile manufacturing. Specific areas include design for manufacturing and assembly, work environment design, systems engineering and integration, process modeling and simulation, precision machining, joining, assembly, automated inspection, integration frameworks, software engineering, artificial intelligence, expert systems, robotics, machine/cell/process control, and sensors/sensor fusion. The center is the focal point for Sandia's work in information-driven manufacturing and has more than 40 laboratories available for collaborative research and development.

Microelectronics Development Laboratory

The 74,000-square-foot Microelectronics Development Laboratory includes 30,000 square feet of clean-room space with 12,500 square feet of class-1 clean space in twenty-two separate clean rooms. A core responsibility of this center is to ensure continued availability of radiation-hard microelectronic components for the weapon program. The laboratory's design provides maximum flexibility for new processing equipment and device technologies and is uniquely configurable to support the joint Center for Contamination-Free Manufacturing. A major donation of equipment and technology by IBM provided a state-of-the-art, submicron, silicon integrated-circuit research and development line. The laboratory's complete equipment set supports the total semiconductor development cycle, including research, design, fabrication, testing, prototype delivery, qualification, and technology transfer.

Four bays of the laboratory will be dedicated to activities of the multichip module foundry consortium and will be used as an equipment applications laboratory. This unit will be an industry-shared site with all next-generation manufacturing equipment and will offer manufacturers, material suppliers, and equipment vendors an efficient way to perfect equipment, materials, and processes.

National Center for Advanced Information Components Manufacturing

In 1993 the Advanced Research Projects Agency (ARPA) began sponsoring the National Center for Advanced Information Components Manufacturing at Sandia to provide a resource for integrating federal and commercial research and development of advanced information components. This integration will allow the United States to greatly compress the time to translate research and development into commercial and defense products. Los Alamos and Lawrence Livermore national laboratories are also supporting the center, along with representatives from industries and universities.

The center has 25 projects now under way in support of the U.S. flat-panel display and advanced information components industry. NCAICM has eight university and 39 industrial partners in 16 states and the District of Columbia. Researchers are concentrating on improving manufacturing technologies associated with emissive flat panel displays, advanced lithography, microelectronics, and optoelectronics.

National Center for Advanced Manufacturing Technology

This center was established at Sandia in 1991 to maximize the value of Sandia's technology base to the manufacturing needs of both the DOE nuclear weapons complex and industry. The center helps transfer and apply advanced manufacturing technologies developed in Sandia's defense programs to commercial manufacturing, thus strengthening U.S. industry's competitiveness. The center serves as a gateway allowing private industry, academia, and government agencies access to Sandia's technical capabilities.

Because manufacturing is very broad, the National Center for Advanced Manufacturing Technology is an umbrella center to several of the supporting centers and user facilities described in this section.

National Center for Ultra-Reliability Engineering

The National Center for Ultra-Reliability Engineering (NCURE) seeks a U.S. competitive advantage in high-value products and systems through technology that makes it possible to achieve high quality. Activities include research and development on causes of device failure, advanced approaches to reliability assurance, and multidisciplinary test and evaluation capabilities. The center will support a reliability SWAT team. A particular emphasis of NCURE is assuring high reliability in small-lot agile manufacturing. The NCURE program has a dedicated staff of three people with approximately one hundred people working on various aspects of reliability technology in a supporting role.

National Solar Thermal Test Facility

Constructed in 1977, this designated DOE user facility enables industry and government to conduct tests requiring intense heat and to collect light with large-scale optics. Specific high-thermal flux applications include investigating the thermo-physical properties of materials and testing various solar applications. Large-scale optics can be used for astronomical observations and atmospheric sounding with a light detecting and ranging system. Testing supports several joint ventures involving DOE, Sandia, and industry, as well as reimbursable programs for customers such as the U.S. Navy, Air Force, and Defense Nuclear Agency.

Test areas include a field of 222 computer-controlled heliostats that reflect concentrated solar energy onto a 200-foot-high tower, two 36-foot-diameter parabolic dishes, two solar furnaces, and a series of line-focus parabolic troughs that track the sun in one axis to concentrate solar power in a line. Thirteen Sandian employees and twelve subcontractors support the operations of the National Solar Thermal Test Facility.

Semiconductor Equipment Technology Center

The Semiconductor Equipment Technology Center (SETEC) was established in 1989 to support the U.S. semiconductor industry consortium SEMATECH in improving the competitive position of the U.S. semiconductor industry. The program has three goals: improving equipment reliability; developing diagnostic techniques for monitoring processes and adapting these techniques to improved process control; and developing models for describing and optimizing manufacturing equipment design and processes. SETEC operations are supported by a staff of approximately 35 people and a cooperative research and development agreement with SEMATECH.

SETEC is improving a number of areas critical to ensuring that the U.S. microelectronics industry will have the reliable, high-quality equipment it needs to remain competitive in global markets and, thus, be in a position to serve future needs of the weapon program. The center's operations are expected to expand into other areas including semiconductor equipment design, semiconductor equipment characterization and improvement, and semiconductor manufacturing control and diagnostic sensor technologies.

STATEMENT OF DR. BRUCE TARTER, DIRECTOR, LAWRENCE LIVERMORE LABORATORY

Dr. TARTER. We agree.

[The prepared statement of Dr. Tarter follows:]

TESTIMONY ON THE MANAGEMENT AND MISSIONS OF THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES

Joint Hearing of the
Subcommittee on Basic Research and the Subcommittee on Energy and
Environment of the Committee on Science
U.S. House of Representatives

March 9, 1995

C. Bruce Tarter, Director
University of California
Lawrence Livermore National Laboratory

Introduction

I am the Director of the Lawrence Livermore National Laboratory. We were founded in 1952 as a nuclear weapons laboratory, and national security continues to be our core mission. In addition, we have major programs in energy, environment, and the biosciences. Our permanent staff numbers approximately 7300, with over 1000 Ph.D.'s distributed over a broad range of disciplines in the physical sciences and engineering.

I am pleased to have this opportunity to comment on the report entitled "Alternative Futures for the Department of Energy National Laboratories" (hereafter referred to as the Galvin Report), and on the report submitted to the Secretary of Energy by the U.S. General Accounting Office entitled "National Laboratories Need Clearer Missions and Better Management" (hereafter referred to as the GAO Report). In my remarks I will speak to the three requested topics, management, missions, and technology transfer, with a focus on those characteristics and issues that all of the Laboratories have in common.

Management

The Department of Energy Laboratories are managed as GOCOs, government owned, contractor operated institutions. As the Galvin Report indicates, the GOCO concept has eroded to a situation in which the Laboratories are in many ways similar to GOGOs, government owned, government operated institutions. In particular, the report does an excellent job of depicting the level of micromanagement and excessive oversight that is now systemic throughout the Department of Energy. There is no single cause, because the massive body of regulations and procedures has been accrued over a decade as a result of numerous legislative and administrative actions.

The impacts are clear, however. On the Laboratories: requirements for documentation that vastly exceed those practiced by successful research and development organizations; numbers of employees whose entire jobs are devoted to interacting with regulators and auditors; and the inculcation of a climate where risk is forbidden, there is the de facto presumption of guilt rather than innocence, and process rather than results is the driving force. Analogously, the Department and other oversight bodies have devoted more and more time and people to enforcing the growing mass of regulations, and on justifying the need for additional effort on the basis of uncovering deviations from administrative perfection. It is an escalating spiral in which audits and reviews feed further regulations which need subsequent audits and so on.

Given this situation, it is not surprising that the Galvin Task Force, most of whose members came from outside the government, has called for a radical de-federalization of the entire Laboratory system. I am not yet ready to take such a step, for two quite separate reasons. First, as I will discuss in the next section, I believe a strong and direct relationship between the Laboratories and those in the Department who are responsible for its technical missions is crucial. It is not clear to me that severing the administrative links with the Department wouldn't also cause significant damage to mission interactions. Secondly, I think the restoration of the GOCO concept near to its original form can accomplish most of the necessary reforms and preserve the special value that it has brought to the Laboratories.

Let me elaborate. The University of California has been the contractor for our Laboratory as well as those at Berkeley and Los Alamos since our beginning. In my judgment, this arrangement has provided great benefit to the Laboratory and the nation. It has been a major factor in the quality of our work force, it has provided an atmosphere in which independent views and honesty are treated as core values, and it has led to an array of scientific and technical associations that would have otherwise not been achievable. And, the University's current contract with DOE is the first to embody performance and accountability as the primary measures of success in its management of the Laboratories.

Consequently, my strong management preference is for the best possible rendering of Appendix B of the Galvin Report. That Appendix spells out in detail the changes required for successful restoration of the GOCO arrangement. The Department has already begun a series of reforms which move significantly along those lines and I hope those efforts will come to fruition. In addition I believe there has to be some way of institutionalizing the results beyond the life of a single administration, and also of continuing to nurture long term relationships with contractors. The Department and the Laboratories have already begun to map out ways of achieving the first goal, and I would hope that contract reform measures could capture the extraordinary values of a sustaining relationship.

In summary I remain optimistic that a restored GOCO concept based on the principles of Appendix B can achieve the needed reforms. This arrangement had many decades of great success, it produced the finest set of federally sponsored laboratories in the country, and I believe it is worth trying to recapture its original principles.

Missions

The Galvin Report clearly and forcefully validates the major missions of the Laboratories in national security, energy, environment, and fundamental science. Within these broad areas, our Laboratory has suggested criteria that are useful in evaluating which kind of work is most appropriate for a national lab:

- The national interest is at stake
- The best science and technology are required
- Large and complex research facilities are required
- Expertise in a variety of disciplines must be integrated
- The technical risk is high, with the potential of very high rewards

- A sustained commitment is needed
- The job will go undone if the national laboratories don't do it

Most of the major programs and projects with which I am familiar at the various Laboratories lie within the core missions and satisfy the above criteria.

Nonetheless, both the Galvin and GAO Reports call for a sharpening of mission focus with a particular emphasis on reducing redundancies or overlapping capabilities. There are suggestions for wider use of lead Laboratories, even to the extent of placing program direction in a single Lab. I believe these kinds of recommendations arise from three factors: the very heterogeneous nature of program direction within the Department leading to micromanagement in some areas, a confusion between scientific capabilities and their applications to projects, and a possible overemphasis within the last several years on the potential to contribute to economic competitiveness.

Let me describe three rather disparate examples in which the mission focus of the Department and its set of Laboratories is working very well, and use the lessons from those examples to comment on the issues raised by the reports.

Stockpile Stewardship — Over the past three years, Vic Reis, the Assistant Secretary for Defense Programs has lead the Department, its three national security labs, and other sites in the weapons complex, in developing a long term plan for post-Cold War stewardship of the nuclear weapons stockpile. The basis for this plan is a detailed technology roadmap driven by the needs of the principal customer, the Department of Defense, and developed under the stringent fiscal realities of the coming years. In executing this plan each Laboratory will have a variety of different roles and in many instances there will be lead responsibilities for subelements of the program. For example my Laboratory would be in charge of building and operating the National Ignition Facility, but scientists at Los Alamos and Sandia would be heavily involved in its technical program and use. Many analogous examples are present at the other Labs, as well as at the other sites within the complex. And, we will all place substantial reliance on industrial collaborators in carrying out our tasks.

Human Genome — The mapping of the human genome is a joint program of the Department of Energy and the National Institutes of Health. Three Labs, Lawrence Berkeley, Lawrence Livermore, and Los Alamos are principally responsible for carrying out the work within DOE. The program was structured in its present form under the leadership of Charles DeLisi and Dave Galas, former heads of DOE's Office of Health and Energy Research, and has been very successful in executing the technical work called for in the general plan for mapping and sequencing the human genome. The program has relied heavily on applying the technologies developed in physical science, computations, and engineering to bioscience; and it has also greatly benefited from the continuous interaction among the three Labs, as well as with academic and industry collaborators.

B Factory — The B Factory is a high energy physics facility being constructed at the Stanford Linear Accelerator (SLAC) with the Lawrence Berkeley and Lawrence Livermore Laboratories as partners. Overall program guidance is provided by DOE's High Energy Physics Office, and SLAC is the clear "lead laboratory". Berkeley and Livermore's responsibilities are in areas where they have special expertise, and the project also involves the contributions of many university participants. There is a well-defined set of milestones and budget allocations.

The common themes in these examples seem quite evident. There is clear program leadership from a single individual and office within DOE, the goal and a roadmap to achieve it are delineated, and there is a distribution of responsibilities among several Laboratories - including lead Lab designation for program subelements in their particular areas of expertise. And, there are very substantial interactions among Laboratories and with industrial and university collaborators to achieve the stated objectives. Each of these examples also meets the criteria I enunciated at the beginning of this section.

Thus, I think it's relatively straightforward to achieve the sharpening in focus recommended in the reports by adhering to the principles outlined above. Specifically, be sure that the goal in each mission area, program, and project, is clear; develop roadmaps to accomplish it (a particularly strong and important recommendation of the Galvin Report); provide straightforward leadership from DOE in utilizing the system of Laboratories, giving them as much technical responsibility and flexibility as possible; and reduce the administrative and oversight excesses discussed under the Management section so that the Labs can become efficient and cost-effective.

In my judgment, the Laboratories will "size" themselves correctly as the mission and program definitions are improved, and as the management requirements are restructured. Arbitrarily prescribing a size or narrow field of competence for a Laboratory goes against both efficiency and effectiveness and inhibits innovation. It is also the kind of technical micromanagement which the reports have argued so vehemently against in administrative areas. For example, the national security mission created centers of excellence in many branches of science and technology, and to restrict their application to defense would hardly be prudent. Similarly, advances in material sciences at all the Labs can contribute to many applied missions. Consequently, I believe that each Laboratory should be held accountable for nurturing core strengths, for focusing on major missions, and for avoiding "job shop" activities, but should be rewarded for innovative and effective application of its special expertise to new and important problems. Reducing the barriers to such application both within the Department and at other agencies should be an important objective.

Technology Transfer

Over the past several years there has been an aggressive effort to stimulate collaborations between the Laboratories and industry. Much of this activity has been directed toward CRADAs, the cooperative agreements in which both the Laboratories and industries contribute resources to carry out projects for joint benefit. There has also been a renewed interest in licensing of technologies to the commercial sector.

While it is now recognized that industrial competitiveness is not a major mission of the Department of Energy, three very important aspects of industrial interactions have emerged. The first is the very real value of executing some of our mission-related work in concert with the commercial sector. This has the virtue of cost-effectiveness, because all the needed expertise does not have to be retained within the Laboratories. It also allows both the Labs and industry to acquire knowledge and competence by applying their skills to a broader range of problems. A second result is that the Lab missions do, in fact, drive very special segments of high technology industry. The supercomputing industry was essentially created in response to defense needs, high power and precision optical firms are strongly supported by Livermore's laser program, and high speed electronics found an important customer in the nuclear test program. Finally, there are a set of real commercial applications for some of the technologies developed to meet program needs. The examples are numerous, but the computer codes used to simulate automobile crashes, and the miniature radar systems developed at our Laboratory have a very large potential impact in the commercial world.

The conclusion seems clear. Facilitate and exploit the relationship of the Laboratories and industry in areas where there is a clear mission need, and where the country will amplify its investment of federal resources.

Mr. SCHIFF. We appreciate that very much. Since we are going straight to questions, I will say that I will observe the five-minute rule myself, as Chair of this hearing.

If there is time, we will have a second round of questioning. I just want to say something here for the record.

I know our three witnesses are accustomed to this, and I would say that probably everyone in the hearing room is, but I know that the comings and goings of members back and forth can be a little bit disconcerting. But the fact of the matter is, that in the House of Representatives, there are a number of things happening simultaneously that address our attention.

So I want to emphasize that a full transcript of this hearing is available for all the members to consider when we consider legislation.

The question I would like to start with all in all—and I'll let you address this anyway you want—do you as witnesses—and I'll call on you individually—do you feel that the Galvin Report has been helpful in terms of focusing on problems and directions on management between the Department of Energy and the National Laboratories and so forth?

What I mean is, do you feel that you and we got a great deal of beneficial result from it?

Dr. Hecker?

Dr. HECKER. The answer's yes. Even before the Task Force Report was issued, the whole process had the beneficial effect of having these ten laboratories work together better than we've ever worked together in the past. That, by itself, I would have thought would have been worthwhile.

In addition, since the Task Force Report was issued, we've had more substantial discussions and progress with the Department of Energy on some of the key issues, such as the missions of the laboratories and the whole issue of governance and oversight.

I think we've made more progress in the last two months than we had in the past five or six years. So I think it's been very positive.

Mr. SCHIFF. Dr. Narath?

Dr. NARATH. I certainly agree with that.

I would also say that the Galvin Task Force activity opened up a dialogue, not just among the Lab Directors, but between the Lab Directors and the Department that had not existed before.

And I think in large measure, as a result of these interactions, we have seen the Department and its laboratories concentrate on implementing many, if not all, of the recommendations of the Galvin Task Force with an enthusiasm and energy that could not have been anticipated.

So I am very pleased by not just what the recommendations have caused, but by the whole process, the visits the Galvin Task Force paid to the laboratories and the interactions it caused between us and the Department have all been very positive.

Mr. SCHIFF. Dr. Tarter?

Dr. TARTER. I would certainly agree with the very positive impact. I think the particular feature, I think Mr. Galvin made it, but I think he has characterized his recommendations on the management as very bold. And I think almost all of us, let me just say for myself, that without being very bold, I think there will probably be very little progress.

I think the catalytic effect of that, I hope, will make the system work much better and either lead to reforms, or a dramatic new structure in which we all can work much more effectively. So I think it's been an extraordinary result in that context.

Mr. SCHIFF. One of the observations of the Galvin Commission Report was that some of the National Laboratories, and I don't know that he necessarily specified which ones, were getting too heavily into the CRADA business.

The implication I read from the report is that some National Laboratories were putting CRADAs as almost their first purpose of life.

As I understood Mr. Galvin's Report, he did not object to the existence of CRADAs, but felt that they should be ancillary to the research and the core technical competencies. I wonder if the witnesses can address the CRADA issue and how they see it.

Dr. Hecker?

Dr. HECKER. I would prefer to put it in the larger context of working with industry. I think to answer that question, my own feeling is that our working with industry is really not an option, it's a business necessity for us to get our job done.

The CRADAs were a convenient vehicle to open up an avenue for us to work with American industry. I think, as a vehicle, to make that sort of opening, they've been very successful.

There's certainly the question that Mr. Galvin's Task Force raised as to whether that's primary or derivative. We certainly have always felt that it was derivative.

So I think the opening to industry has been very beneficial in the past couple of years. I think we now will certainly take a very close look as to how it reinforces our missions.

Mr. SCHIFF. Dr. Narath?

Dr. NARATH. Make no mistake about it, DOE and its laboratories cannot succeed in executing their missions without very vigorously interacting with the private sector, both industry and universities.

I think it's important to recognize that the CRADA, after all, is just a tool. It's a means to an end.

I might say, back in 1989 when this tool was first created, it took quite some time before the attorneys could reach agreement as to how we might implement that tool.

There was a lot of skepticism as to whether the CRADA would indeed become an effective tool and it shouldn't come as any surprise to anyone that the emphasis, therefore, during the early years, was on maximizing the number of CRADAs.

It's important to recognize that we made a great deal of progress since that time. And if you examine the various labs who were actively involved in industrial interaction, you will see much greater focus today than there was a few years ago.

We are indeed focusing on our mission responsibilities and the underlying scientific and technological foundations and our interactions with industry very much emphasize a mutual interest in these areas.

So I'm very positive on industrial interactions. I think these are absolutely essential if we are to succeed, and please, let's just look at the CRADA as one of many tools that help us accomplish this.

And incidentally, from the taxpayers' standpoint, the CRADA offers a tremendous advantage. That it's an instrument that encourages cost sharing arrangements so the taxpayer really does get an extra benefit.

Mr. SCHIFF. Dr. Tarter?

Dr. TARTER. Again, I think we could almost do a Larry, Curley and Moe. I think the results for the past several years has been an extraordinary enhancement and application of the effectiveness of how we work with industry.

The CRADA was a very useful vehicle in basically creating that awareness and focus within the laboratories.

I think, as I said in my written testimony, there are many ways in which we now have improved the interaction with industry and I think it amplifies the Federal investment and makes the laboratories better. And I think the overall product is better, both for the country and for the investment part. So I think we've all benefitted after this experience in the three years, even if the road may have been a bit rocky along the path.

Mr. SCHIFF. I see that my time has expired.

Before I recognize the next member, let me just say that if this is Curly, Moe and Larry, I'm the fourth individual here on the team, because I agree with the statements that you have made. I think there's a place for working with industry, maybe not necessarily locked into the word CRADA, but there's a place for working with industry, but that should be assimilated within, pursuing the core technical competencies of the laboratories, and not become some kind of new primary mission.

I think if we keep it that way, I think it will be best for industry and best for the National Laboratories. Mr. Roemer is recognized for five minutes.

Mr. ROEMER. Thank you, Mr. Chairman. My question would be to all three of you.

The Galvin Task Force recommended that the DOE laboratories work only to enhance the U.S. position in four R&D areas: national defense, energy, environmental and fundamental science.

My question would be how much of the laboratory budget is dedicated to areas outside these four specified in the Galvin Report?

Dr. Hecker? I can see this is a popular one.

[Laughter.]

Dr. NARATH. Let me try.

The Galvin Task Force did emphasize the four mission areas. These mission areas are extremely broad and they depend, for their success, on a range, on a spectrum of scientific and technological advances that are just extraordinarily broad.

Frequently we find it advantageous to work with industries and universities where the end products may look very different from what DOE is responsible for, but where the scientific and technological underpinnings are very common.

I might mention the work we're doing, for example, with Goodyear Tire and Rubber Company. There are no rubber tires on nuclear weapons, to the best of my knowledge. Nonetheless, the sort of structural dynamics problems that arise in designing a modern, high speed tire turn out to be very similar to technical issues that arise in analyzing the crush up of weapon components under accident scenarios.

That interaction produced great benefits to both parties and I would say it was very much mission-related from a DOE and Sandia viewpoint.

So if you think of it more in terms of the science and technologies required to satisfy DOE's mission responsibilities, then I think you begin to see a picture of a much broader domain for the laboratories to involve themselves in.

Mr. ROEMER. Just try to answer the question though. I realize it's somewhat difficult, but try to answer the question.

What percent or how much of the laboratory budget is dedicated to those areas outside of the four recommended in the Galvin Report?

Dr. NARATH. All of the work at my, and other DOE laboratories, is funded by the Department of Energy or other government agencies using funds appropriated by the Congress. I don't do any work for which I don't have specific authorization. And I just have to assume that these appropriations and authorizations are in line with the responsibilities of the agencies who give me guidance for these programs.

Mr. ROEMER. So I don't get an answer.

Dr. NARATH. I think the answer is zero percent.

Mr. ROEMER. Zero percent?

Dr. NARATH. Yes, sir.

Mr. ROEMER. Dr. Tarter?

Dr. TARTER. It's going to be a number, which whether it's zero as Dr. Narath has said, because that's the way the funding channels come. If you wanted to do a sweep through technologies through disciplines, it's going to be in fractions, a few percent at most, perhaps a fraction of a percent, perhaps zero percent. It's a very, very small number. Let me pick up on an analogous example to the one Dr. Narath gave.

One of the things our laboratory has done, as mentioned in the written testimony, and it comes back to the industrial interaction part, is we have a computer code which simulates what happens when, basically, part of a warhead impacts the ground. It says what happens, how it breaks up in stresses and strains. It turns out that has been an extraordinarily effective vehicle when used by the automobile industry to simulate car crashes. I think it's been very cost effective for them to take that computer code.

Now, as it turns out, their use of that computer code has revealed a whole number of aspects of our code which have improved our code for its own purposes. Now that is a very small amount of funding. In fact, essentially, it's an informal licensing process. So I don't know how you want to count that. That's why I think it's so hard to give you an indication.

As far as the funding, as Dr. Narath has said, the number is essentially zero. When we do an application on that, or the one which Congressman Baker mentioned, the application may be outside that line, but that's still a very small number and I think in those cases, it's been extraordinarily beneficial.

Mr. ROEMER. My question, though, is not what Dr. Narath interpreted, as to what Congress has appropriated money for. It is the Galvin Commission's recommendations. Dr. Hecker, would you try to answer the question?

Dr. HECKER. In the broadest sense of that interpretation, I would agree that essentially a hundred percent of Los Alamos fits into those missions.

The narrower interpretation, for instance, if you say national security, the Department of Energy's only nuclear weapons related. We do work for the Department of Defense that's not nuclear weapons related. We do some work for the Department of Transportation and for the National Institutes of Health.

So, if you interpret it narrowly, then about 15 to 18 percent of what we do at Los Alamos is not directly funded through the Department of Energy, but indirectly. However, it supports the other missions.

Mr. SCHIFF. Did you want a brief follow up on that?

Mr. ROEMER. I would just briefly follow up with one additional question, and also say that I have visited both Los Alamos and Sandia before I was a member of Congress, and was very impressed by what the laboratories in those two areas have accomplished.

I also noted that, Dr. Hecker, Los Alamos downsized between '90 and '94. Is that primarily due to the close down of the civilian program? What was that attributable to?

Dr. HECKER. From 1990 to 1994, the core nuclear weapons effort decreased substantially. In fact, if you expand it over about seven years, it decreased by a factor of two to half of what it was in 1987.

Some of the civilian programs, actually during that time some of the basic research programs, actually decreased. It's a combination of those two, offset by an increase in the environmental restoration budget.

The overall has been a downsizing of about a thousand people out of eight thousand University of California employees.

Mr. SCHIFF. Thank you.

Mr. Baker of California is recognized.

Mr. BAKER. I'd like to yield to Mr. Graham who has a meeting urgently.

Mr. SCHIFF. Mr. Baker reserves his time. I recognize Mr. Graham for five minutes.

Mr. GRAHAM. Thank you very much, Mr. Baker. I appreciate it.

I guess this is directed at Dr. Hecker about tritium production. I asked Mr. Galvin a few minutes ago about tritium production, the need for it and the technology to be utilized in that regard.

First, let's get on to the question of need. From having looked at this, Savannah River is in my district, and talking to some people on the Defense side of the House, it appears that we need to get on with the production of tritium in this country. Do you agree with that?

Dr. HECKER. Yes. Of course the amount of tritium is strictly dictated by the Department of Defense's needs for numbers of weapons. For the START II scenario, translating the Department of Defense needs into the tritium needs, it is currently projected that we would need new tritium at about the year 2010 to 2011.

It would take us on the order of ten to 15 years to have a new production capability, and so the answer is yes, we'll need tritium and yes, we need to worry about how to produce that tritium.

Mr. GRAHAM. So we're looking at 2010, 2011 and it's ten years or so to actually have the substance produced.

When it comes time to pick a technology, obviously I'm interested in that, having Savannah River in my district, which has produced tritium for a long time. The accelerator seems to be an option and the reactor, the new production reactor, seems to be an option. Could you tell me, in your opinion, what's the best way to go and why?

Dr. HECKER. I have a very prejudiced and parochial view of that.

Mr. GRAHAM. I know you do. And I'm not trying to put you out of business otherwise. Maybe let you all do something else.

Dr. HECKER. Let me preface my answer by saying that one of the things that the laboratories do is to offer options to the U.S. Government.

In the tritium arena, it occurred to us some years ago that it would make a lot of sense, perhaps, to make tritium with accelerators, instead of reactors. The last time around, several years ago, that seemed to be going in favor of the reactors because of the amount of tritium that was projected to be required by the Department of Defense. Since that time, the amount has gone down so substantially that the accelerator is a very good option. So now, to answer directly, I, personally, at this time, think that the accelerator is the best option.

Mr. GRAHAM. That doesn't surprise me. In that regard, are there any efforts to privatize the production of tritium through an accelerator process, to get private companies involved?

Dr. HECKER. I think the Department of Energy is studying exactly how to produce that tritium. That certainly is one potential option, but I'm not aware of it really being the leading option right now.

Mr. GRAHAM. One last question and I'll go. How about a deal? You all keep researching the accelerator and we'll produce it at Savannah River with the reactor?

[Laughter.]

Dr. HECKER. I'm not sure that was a question.

Mr. SCHIFF. The gentleman's time has expired.

Ms. Lofgren is recognized for five minutes.

Ms. LOFGREN. I realize we have a vote on, so I will be quick.

The Galvin Report recommended that many of the Defense research functions at Lawrence Livermore be transferred either to Sandia or to Los Alamos.

I'm wondering since this would involve potentially all the labs, what your opinion is of that recommendation, and specifically for Dr. Tarter, what would that do to Livermore Laboratory. What impact would that have on the other missions?

Dr. TARTER. Let me try to respond.

This is a complicated question which you've already heard a great deal of discussion about this morning. I think I would start, perhaps, making three short points.

The first is one I think Mr. Galvin has made, and all of us have taken to heart with regard to all the functions of the Department of Energy and that is that we need a roadmap to where we're going, whatever the job we're trying to do.

I think Mr. Galvin also, in a very articulate way, said the goal in the national security and nuclear weapons area is the safety and reliability of the nuclear stockpile.

So what I think has gone on, in parallel with the study of the Task Force, is a very broad look within the Department of Energy on how best to accomplish the goal of a reliable and safe stockpile, with two other additional features thrown in. One, how do you save money, and, how do you meet the needs of the customer for your product, which is the Department of Defense.

So I think the proper question is how do you provide a roadmap to do those objectives. The roadmap on that within the Department of Energy involves not just three laboratories, but three laboratories, the Nevada Test Site, and what were about ten production sites distributed throughout the country.

So how I would characterize, in a very short fashion, my response is that when you look at the full system of the ten production sites, the three laboratories and the Nevada Test Site, and now you want to do your job of a safe and reliable stockpile, you want to save money as much as possible, and meet the needs of the customer, then you get a solution which has a broader and wider scope of activities within the Department of Energy laboratories. I think Dr. Reese has testified before the Energy and Water Subcommittee two weeks ago on that topic, and I think that's described there. I won't take more of your time here.

I think to be specific on Livermore we have already, I think over the past several years, done substantial consolidational functions within the laboratories. I think that should continue, and I think, for example, I think it's clear that working on plutonium in the long term, as the Galvin Task Force recommends, is a function that should be done in one place. I think that place is clearly Los Alamos.

I think working on the National Ignition Facility is something that would be very well done at Livermore, but all the laboratories work in various places.

So I think when the details are done, and I think Secretary O'Leary indicated that Dr. Drell had a longer horizon for doing the consolidation, that, in fact, the system will still be very robust and the laboratories will be very healthy institutions.

Mr. SCHIFF. The gentlelady's time has expired.

I'd like to just check with the members and see how many minutes of questions—I'd like to be able to release this panel so they're not here through two votes. Mr. Baker, two minutes.

Mr. Ehlers, how much time would you like?

Mr. EHLERS. I have no questions for this panel. I was going to give a two-minute compliment to Dr. Galvin, but I can speak to him privately.

Mr. SCHIFF. Ms. Jackson Lee, how much time do you desire?

Ms. JACKSON LEE. I can take more, but I can ask my question in two minutes. I don't know whether they can answer it. Can we come back after this vote?

Mr. SCHIFF. I was hoping, if there was no objection, to let this panel go and proceed to the next panel of lab directors, if we can do that.

Let's see what we can do in two minutes, and I'm sorry, and I apologize to the members that we are pressed.

Mr. Baker, you're recognized.

Mr. BAKER. I'll make this very brief.

Mr. SCHIFF. I presume this panel would be receptive to questions in writing submitted by me, so I would invite members to submit questions to them.

Mr. BAKER. Thank you very much, Mr. Chairman. Thanks to the panel.

I am a budget analyst and I apologize for sounding like one. I'm also a strong advocate of science in government. I took the opportunity to introduce Dr. Tarter to John Kasich. A very interesting meeting, I must say, that lasted nearly 45 minutes.

I wanted John, our chief budget cutter, to know that he had resources in the science community when he wanted to prioritize and ask questions. Now John has that resource, as he has with his own Ohio colleagues in the science area. So we're not going to rise above it because we think we're more important than anyone else. Bruce knows this, so does everyone else.

Medicare doesn't go broke 'til next year. Regardless of anybody's politics, the numbers are there. It doesn't go deeply in the red until next year.

Social security, when the baby boomers turn around and stop being peers and start taking, doesn't drive the social security system bankrupt until 2012.

Those things are going to happen no matter how many speeches are made on the Senate Floor on the balanced budget and how they love all people more than republicans. It doesn't change one bit.

The same is true in the scientific community. I don't believe we can sit here and tell you how to do science and where to do it.

But I do know we're going to become more efficient. So I appreciate your role and I know you are meeting regularly, as lab directors, to try and more efficiently parcel out the work that we all want done. I believe in the creative process.

I don't think that Dr. Galvin's recommendation is that we stop having relationships with corporations. I think we want to increase that. But we're not going to put up more money. We're going to lean more heavily on the corporations. So I'd appreciate your getting together and coming back to us, and I'll close with this one-second allegory.

We believe in the private sector. Our speaker brought in his peanut farmers, his supporters, and he said we're not going to set prices of peanuts any longer. We're not going to have marketing orders, we're not going to have government intrusion in the marketplace. You're gone in three years.

We say the same thing to you. Become more efficient, not because we tell you, but get together and show us how to make you more efficient. We on this Committee are going to support you a hundred percent.

Thank you. I'd like to have more time to ask questions but will do it later. I appreciate the work you're doing.

Mr. SCHIFF. I would again remind the gentleman that if he submits questions in writing, I'll submit them to the panel.

Ms. Jackson Lee?

Ms. JACKSON LEE. Thank you very much, Mr. Chairman.

I'd like to pose this question to all three. I think, in light of the time, I'd like to have it in writing, just to answer the question regarding the downsizing that I think has been asked in a variety of ways.

But in any event, in light of where we are post-war and the prospective of downsizing the DOE laboratories, can we actually say that there is no negative impact on the environment and dealing with stockpile stewardship and certainly national defense?

I guess I ask it in the negative because that's the way I'd like to be responded. Are we not in jeopardy of a negative impact? And if not, what would be your approach and solution, to suggest that that is not the case?

Those are very vital issues for many in our community, particularly my state has a great interest in that, and I'd like to have a response to that question and I'll take it in writing.

Thank you.

Mr. SCHIFF. I thank you for your cooperation, Ms. Jackson Lee. The Committee will be in recess until after these votes. The second panel is excused with our thanks. And we'll take the third panel as soon as we come back.

[Recess.]

Mr. SCHIFF. [Presiding]. I'd like to reconvene the Subcommittee hearing and I'd like the third panel here. I'd like to welcome our third panel to this hearing. We have Dr. John Denson, the Director of the Idaho National Engineering Laboratory, Dr. Charles Gay, Director of the National Renewable Energy Laboratory, Dr. Nicholas Samios, Director of Brookhaven National Laboratory, Dr. Alan Schriesheim, Director of Argonne National Laboratory, Dr. William Madia, Director of the Pacific Northwest Laboratory, and Dr. Charles Shank, Director of Lawrence Berkeley Laboratory. And excuse me, of course, Dr. Alvin Trivelpiece, Director of Oak Ridge National Laboratory.

Gentlemen, thank you all for being here, and thank you for your patience in waiting to testify. There has to be a first panel and a third panel. Sometimes, it's the luck of the draw as to who is which.

Let me invite you to offer opening remarks if you wish to. But, as I'm sure you heard with the previous panel, your written statements, if any, will be made a permanent part of the record of this hearing. Therefore, you are free to waive further comments, but it is your call. We'll start over on my left with Dr. Denson.

STATEMENT OF DR. JOHN DENSON, DIRECTOR, IDAHO NATIONAL ENGINEERING LABORATORY

Dr. DENSON. I'll waive. I've submitted written comments.

[The prepared statement of Dr. Denson follows:]

Statement of W. John Denson

Director, Idaho National Engineering Laboratory

Before the House Science Committee

Subcommittee on Basic Research

Subcommittee on Energy & Environment

U. S. House of Representatives

Washington, DC

March 9, 1995

Chairman Rohrabacher, Chairman Schiff, and distinguished Subcommittee Members. I appreciate this opportunity to present testimony on the recommendations of the Galvin Task Force and the General Accounting Office regarding the future of the Department of Energy's national laboratories. I commend you for the serious attention you are giving not only to the role of the national laboratories in our country's intellectual infrastructure, but also to the larger goal of sustaining America's science and technology leadership in an era of budget constraints and global change. This is an important challenge, and I hope my remarks today will contribute to your deliberations.

I am here today in my capacity as Director of the Idaho National Engineering Laboratory (INEL), a responsibility I have held since Lockheed assumed management of the INEL. As a professional engineer and business executive whose career has focused principally on complex systems engineering and integration projects, I am honored to join you here with my distinguished colleagues from the other national laboratories. I will suggest to you during the course of my remarks that the Idaho National Engineering Laboratory is contributing significantly to national needs, and that our contract with the Department of Energy represents a clear departure from the status quo examined in the reports of the Task Force on Alternative Futures for the Department of Energy National Laboratories and the General Accounting Office.

Before addressing the specific areas of interest to the Committee, I would commend Secretary O'Leary for her creative leadership in this period of global transition. Her bias for action in establishing the Task Force on Alternative Futures for the Department of Energy National Laboratories reflects the commitment to substance and results that she has applied to her vision and strategic approach in structuring DOE to better serve the Nation's needs. Her selection of Robert Galvin to chair the task force also reflects her willingness to accept the results of an independent assessment team guaranteed to distill the task to its essence and to present recommendations that are both thought provoking and innovative. I believe she and the task force have made a significant contribution to sound public policy through this initiative, and that Chairman Galvin has demonstrated his unique qualifications for this important responsibility.

SUMMARY COMMENTS ON RECOMMENDATION OF THE REPORT ON ALTERNATIVE FUTURES FOR THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES

The Idaho National Engineering Laboratory is a government-owned, contractor-operated federal facility. My primary departmental accountabilities are to DOE's Idaho Operations Manager, John Wilcynski and the Assistant Secretary for Environmental Management, Tom Grumbly. Within Lockheed, I report to the Chairman and Chief Executive Office of the Corporation, Dan Tellep. In addition to Lockheed and DOE accountabilities, my obligations are to the INEL workforce, the people of Idaho, and the taxpayers of the United States.

Generally I endorse the task force recommendations in their substance and scope. On the specific issues of governance, missions, environmental management, and technology transfer, I would like to offer the following observations:

GOVERNANCE: I believe that the Department of Energy and its national laboratories would greatly benefit from a system of governance through which the National Laboratories act as a system of laboratories and where conflicts of purpose, policy uncertainties, and programmatic competition can be resolved. Such a structure would both enhance the Department's and Congress' oversight capabilities by integrating the laboratories' operations and missions into a more cohesive whole while reducing redundancy and other inefficiencies. Of the two models suggested separately by the Galvin Task Force and the Secretary of Energy, I believe the structure recommended by the Secretary would bring greater near term improvement to the current system without reshaping too drastically the essential working relationship between the Laboratories and the Department's missions. I believe the Laboratories should be directly linked to the Department since the technical strengths of a national laboratory system provide the foundation for the long term contribution to DOE in solving the nation's and world's energy needs.

In terms of improving the management and performance of the national laboratories, I strongly endorse the implementation of Appendix B of the Task Force Report in its entirety. Implementation of these recommendations would result in significantly improved return on the federal investment in the national laboratories and equally significant reductions in overhead and operating costs. Coupling the implementation of Appendix B with the Secretary's realignment initiative could enhance the effectiveness of the national laboratories in supporting the energy missions of DOE.

MISSIONS: The Task Force report states on page 1 that it found multiple missions and sub-missions across the complex, but that the essence of what the Department and its Laboratories should and do stand for is to support the national energy agenda. The real strength of the national laboratories is in the unique capabilities of the scientists and engineers at each laboratory. The laboratories apply these capabilities to programs through a lead laboratory with other laboratories supporting. The uniqueness of these capabilities can be found in the superiority of the nuclear weapons program and the establishment of the nuclear power industry--an accomplishment of significance to the INEL.

ENVIRONMENTAL MANAGEMENT: The Task Force acknowledges the need for a larger role for the labs in applying high quality science and engineering to the environmental component of the energy agenda. While I endorse the use of the national laboratories in solving the science issues of this mission and believe that a lead laboratory should be established, I do not agree with the report relative to the status of the Environmental Management Mission. Much has been accomplished since Assistant Secretary Grumbly took control. He has, through Dr. Frank, established a new focus to the technology development area, is rapidly moving the mission from studies toward results, is rightsizing the workforce, and has reduced the budget requests significantly for the next five years. The mission needs a sound systems engineering and integration approach so that the science which is truly needed can be defined. A distinction of the environmental mission is the existence of a multibillion dollar environmental industry which invests significant capital in a broad range of new technologies and services to solve environmental problems. Mr. Grumbly has rightfully pushed industry to invest and to bring new technologies forward. This approach avoids investing government funds where industry is technologically positioned to achieve results. An example of this is Pit 9 at the INEL, which I discuss later. I believe this approach supports the Galvin Task Force concern about government research conflicting with industry.

TECHNOLOGY TRANSFER: Developing technologies for government programs consumes public funds. The transfer of derived-use technologies to the private sector transforms a portion of these consumed funds to an investment in the nation's future. The four primary missions will be strengthened by a properly exploited and directed technology transfer programs.

The system of collaborative R&D agreements between the DOE labs and industry have greatly benefitted both the laboratories and their industrial partners. As the president of a private company, I participated in such an agreement on a competitive basis. The resulting technology has the potential to impact the long-term solution to nuclear waste volume reduction. As the Galvin Task Force has recommended, however, these agreements must be in areas of legitimate DOE missions and should be restricted exclusively to derived-use technologies. Cooperative Research and Development Agreements (CRADAs) should preserve intellectual property rights for the government to provide a return on investment and to prevent the appearance of exclusive windfall advantages for particular industries or firms.

THE IDAHO NATIONAL ENGINEERING LABORATORY

MISSION: Established in 1949 as the National Reactor Testing Station under the Manhattan Project, the Idaho National Engineering Laboratory today is a unique national resource for applied engineering and systems integration expertise. The INEL maintains critical technology skills for nuclear operations, nuclear safety, and nuclear waste management. The INEL is broadly focused on applied engineering and research in environmental restoration, energy systems , and derived-use technology transfer. The INEL is a multiple purpose laboratory supporting all the missions of the Department and the missions of other Government Departments in a work-for-others program. Approximately 60% of the site's funding is derived from appropriations to the Environmental Management missions for both environmental restoration and waste management. Because of our significant participation in supporting the Department's environmental programs, I have reason to disagree with the Task Force's conclusions on the effectiveness of these programs, as previously stated. The INEL has been designated by DOE's Assistant Secretary for Environmental Management, Tom Grumbly, as DOE's lead Laboratory for research and development on mixed waste technology focus area. As we define the science and research needs of the focus area, the National Laboratories, with their specific capabilities, will be integrated into the development process. We also lead the national program for Spent Nuclear Fuels Management and National Low Level Waste Management. In partnership with the Department, we are establishing Technology Centers of Excellence for Mixed Waste, Derived-use Technology Transfer, Systems Analysis and Engineering, Energy Research, Nuclear Operations and Nuclear

Safety. We are combining the resources of the INEL and Lockheed to apply advanced technology and treatment systems to a variety of hazardous, mixed, transuranic, and radionuclide wastes found across DOE's facilities complex. This is evidenced by the Pit 9 program in which we are establishing a privatized approach to remediating buried mixed waste where the contractor assumes all the responsibility for establishing an effective waste treatment system, and is not paid for the investment if the process does not accomplish the tasks.

SYSTEM OF GOVERNANCE AT THE INEL: Three issues exist in our current system of governance: First, funding is allocated through what is termed "stovepiping." The funding is allocated from Headquarters and by Congress such that the horizontal program integration at the site is difficult, if not at times impossible, to achieve. Second, I do not have the flexibility in funding to set priorities for the Laboratory's work. Third, the micro management and countless audits utilize scarce resources which could be more appropriately applied to the missions of the Department. Appendix B and the Secretary's governance approach should help resolve these issues.

THE INEL CONTRACT: The new contract at the INEL was developed and is being implemented under the Secretary's Contract Reform Initiative. It closely parallels the Galvin Task Force recommendations for better performance and greater accountability by the National Laboratories. The contract shifts accountability and responsibility from the DOE to the contractor. It is structured to be performance based, where the government pays for results -- not transactions. Our approach is to run the INEL like a business, where we carefully manage cost and schedules and our overheads while maintaining an intense focus on employee safety and health. We initiated at contract start a rightsizing of the workforce to eliminate redundancies and become more efficient. Our current workforce of 7,650 is being reduced to approximately 6,400 through the rightsizing. We have focused heavily on reducing overhead and general and administrative costs.

Some important features of the contract which support the Task Force's recommendations are:

- A graded approach to DOE Orders where we will only apply those parts of the orders which are necessary to enhance performance and safety.
- Reduction in micro management by the DOE by moving to an incentive fee structure which makes the contractor fully accountable for results.
- A commercial procurement system to increase efficiency in the process.

I believe there are elements of this contract worthy of your close consideration as Members of Congress with jurisdictional responsibility for many Department of Energy programs and the national science and energy agendas.

TECHNOLOGY TRANSFER PROGRAMS AT THE INEL: Our technology transfer approach for the INEL supports the Derived-use recommendation of the Task Force. We strongly believe that the key to successful technology transfer is through the investment of venture capital. Venture capitalists will closely evaluate technologies prior to investment. We also believe that the transfer of the scientists and engineers with the technology is essential to its success. We selected the best of three models to derive our process: The Oak Ridge Model from the Government; the MIT Model from Universities; and the Thermo Electron Model from Industry.

Thermo Technology Ventures, Inc., has been formed in Idaho Falls, Idaho, and capitalized at $1 million to provide initial venture capital. TTV has extensive access to the venture capital market to supply additional funds as the transferred technology matures. Initial assessments of the technologies developed for government programs at the INEL is complete and several technologies show promise for technology transfer through venture capital or the CRADA process.

We are also pursuing industry partnerships with some of the more advanced technologies to expedite them to market. In all of this, we have at risk a significant portion of our fee in producing defined results. Our confidence in this approach is such that we reduce, on an annual basis, the fee bearing base of our research and development funds as a guarantee to the government and ourselves that we will achieve the desired results.

To support this effort, the Secretary of Energy has approved establishment of the **Technology Exploitation Pilot Project** (TEPP) at the INEL to permit exploration and testing of procedural and policy restrictions on the transfer of federally-developed technologies.

CONCLUSIONS: The Secretary and the Galvin Task Force have made a significant contribution towards defining appropriate roles and structures for the Department of Energy's national laboratories. The national laboratories must be preserved as a critical national asset for maintaining scientific and engineering leadership in a changing world. Implementation of Appendix B and the Secretary's governance approach will improve efficiency and effectiveness of the national laboratories. Many of the keys to improved performance, accountability, and return on investment called for in the reports from the Galvin Task Force and the General Accounting Office are reflected in the type of contract we are implementing at the INEL.

Thank you for the opportunity to represent the Idaho National Engineering Laboratory before you today. I am proud to do so, and hope my comments are helpful to the Chairmen and Members of the Subcommittees.

STATEMENT OF DR. CHARLES GAY, DIRECTOR, NATIONAL RENEWABLE ENERGY LABORATORY

Dr. GAY. I will do likewise.

[The prepared statement of Dr. Gay follows:]

Testimony of Dr. Charles F. Gay

Director
National Renewable Energy Laboratory
Golden, Colorado

Before the
U.S. House of Representatives
Committee on Science
Subcommittee on Basic Research and
Subcommittee on Energy and Environment

March 9, 1995

My name is Charlie Gay, and I have just become the Director of the National Renewable Energy Laboratory (NREL) in Golden, Colorado – the nation's premier national laboratory for renewable energy and related energy efficiency technologies. I have a Ph.D. in physical chemistry and 20 years of industry experience. I served as research director, manufacturing vice president, and then president of ARCO Solar and its successor, Siemens Solar Industries, during its evolution into the world's largest photovoltaics company. Most recently I was co-founder and managing director of UNISUN, a specialty consulting firm that works to organize, finance, and implement renewable energy projects and ventures around the world. This private sector experience in international business management, industrial operations, new venture formation, and venture capital was an important factor in my selection as the new Director of NREL.

I have come before your subcommittees to address some of the major issues raised by the Galvin and GAO reports. I will describe how NREL already consistently operates within the core framework of these reports, and I will discuss how NREL's programs are being modified to better respond to the recommendations in the reports. I will briefly summarize some improvements and an example of one innovative approach for spinning off technologies that we have already initiated and which NREL is pursuing to assure that its operations are run in an efficient, professional, and businesslike fashion.

NREL's Responses to the Galvin Task Force and GAO Recommendations

Both the Galvin Task Force and GAO Reports have recommended changes in the operation and structure of the DOE and its national laboratory system to better leverage the nation's research investments and to better meet the nation's strategic needs. These recommendations are made as the Administration is seeking to reinvent government to make it leaner and more responsive, and as the Congress of the United States is seeking to reduce and redirect the government's role toward a well-defined focus on issues of national security and prosperity. At the same time, an increasingly sophisticated international marketplace requires that the nation take maximum advantage of all of its resources, including those of the national laboratories.

Let me state at the outset that NREL's role and operations already conform to a majority of the key themes of the Galvin and GAO recommendations. NREL's responses to specific areas highlighted in the reports and to the direction set forth by the Administration and Congress are as follows:

Mission

Both reports emphasize that *each laboratory must have a well-defined mission.* NREL's mission is well focused and embodied succinctly in its name. Our clearly stated mission is to lead "the nation toward a sustainable energy future by developing renewable energy technologies, improving energy efficiency, advancing related science and engineering, and facilitating commercialization." NREL is the only DOE laboratory solely focused on the development of renewable energy and related energy efficiency technologies, which may be essential for long-term national security and economic prosperity.

Everything NREL does – its R&D; its partnerships with industry, academia, and other organizations; its subcontracts; its research and development agreements – is directed at originating and accelerating the maturation of viable renewable energy technologies (including wind energy, photovoltaics, and biomass conversion for fuels and power) and related energy efficiency technologies, from the early stages of research and development to the onset of commercialization. About 50% of NREL's budget supports industry and university partners, and virtually all of our industry collaborators cost-share these efforts. We have a total of 380 such partners representing participation in nearly all states of the Union. As a technology moves closer to commercialization, industry assumes a proportionately greater responsibility for defining and funding its development. We do not undertake projects that might divert us from our mission.

A Center of Excellence

The Galvin report calls for establishing centers of excellence and for establishing lead laboratories according to mission assignments and strengths. Over its seventeen years of existence, NREL has succeeded in establishing itself as the nation's center of excellence in renewable energy and energy efficiency technologies. It has assembled a highly skilled technical staff of approximately 1000 scientists, engineers, technicians, and support staff, and it is the world's leading laboratory in research and development of renewable energy technologies. NREL is outfitted with state-of-the-art experimental and analytical facilities used both for in-house research programs and in collaboration with industry and academia.

Knowing Where You're Going and How to Get There

One of the recommendations made by the Galvin Task Force was that energy R&D at the DOE laboratories should be coordinated with industry and guided by road maps. In other words, a laboratory should work with industry, academia, and other experts to develop a comprehensive plan that identifies, for example:

- the potential value of a given technology in the nation's energy mix and economic well-being,
- how the technology could evolve and what might be done to facilitate and/or accelerate this evolution,
- what milestones should reasonably be set,
- what resources should be allocated to development, and
- at what point to hand-off the technology to American industry or to terminate the effort.

NREL has long had such plans for each technology, developed to reflect a balance between near-term and long-range strategies. Because these technologies will one day be at the core of new business ventures, NREL has a tradition of working hand in hand with industry to plan the development of technology as well as to offset the development risk with industry on some of that evolution. Close cooperation with industry has been a traditional requirement at NREL from its beginnings. Our 1977 founding charter directed us to nurture the development of an industry base. (Progress in this regard is illustrated in the attached figure for several key technologies.)

NREL has independent review boards consisting of people from industry, trade associations, and academia. These boards participate in all phases of the conception and implementation of NREL's development programs and in the evaluation of their progress. Board members contribute a diverse mix of technology and business perspectives that helps to assure that the activities receiving development resources will have widespread and valuable applications and economic benefits. NREL also receives a "report card" from the Department of Energy every six months under the performance-based award fee provisions of the NREL contract.

Although this has proven to be a valuable process, we can make continuous and quantifiable improvements. One of the specific actions we are taking with DOE is the creation of "sunset clauses" for technology development projects. We will devise criteria by which we can determine when a technology has become a success and should be spun-off to private industry, when a technology cannot reach its goals and must be abandoned or redirected, and how to objectively rank technologies so that programs can efficiently respond to budget constraints or changes in the energy priorities of the United States.

The Business of the Laboratories

The Galvin report concludes that the laboratories should be run more like businesses and should be driven by cost effectiveness as well as by technical innovation. I agree with the spirit and the principles of this recommendation. NREL already operates from a businesslike perspective, and we can enhance this orientation by adopting the business maxim of delivering the best return on investment. I will assure that NREL delivers the best return by providing the leadership necessary to establish a clear management direction and to empower employees at every level. As with industry, this approach should result in constantly improving cost effectiveness and competitiveness.

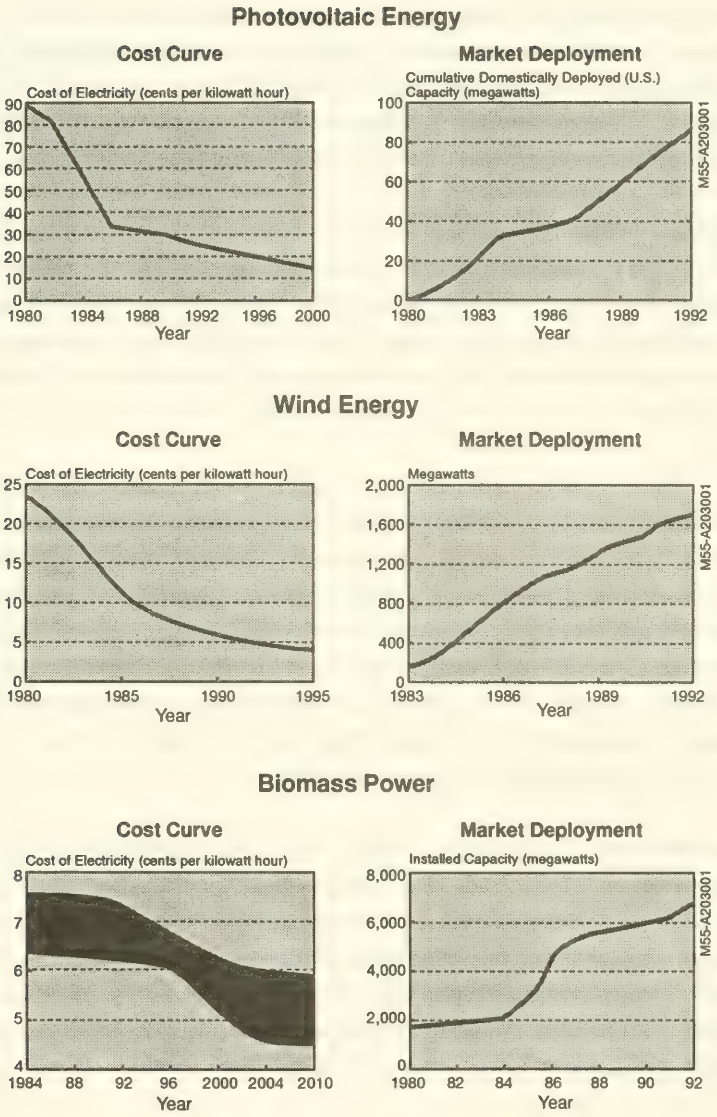


Figure 1. Renewable Energy Progress

That's not all we can do. We are exploring structural changes to improve the way we operate. We are working with the NREL controller to determine administrative changes that would improve our internal operational efficiency. And, during my first week on the job, the NREL senior management team held a two-day strategic planning session in which we discussed how we could expand and diversify our funding base and how we could provide more value to the DOE and to the American taxpayers.

Privatization of National Laboratories

In its emulation of the business paradigm, the Galvin report suggests a model for turning the national laboratory system into a quasi-private organization. We should be thoughtful and cautious in implementing this suggestion. We must be certain to protect the ability of the national labs to serve the fundamental, long-term strategic interests of the nation while reconfiguring the labs for greater cost efficiency and responsiveness.

During my years of experience in industry I gained insight into mergers, acquisitions, and the process of commercializing technologies. NREL can accelerate the commercialization of promising technologies by spinning off technologies to new venture start-ups and into corporate alliances. In this way NREL could build on its success of having spawned some 27 start-up companies during its brief history. NREL can spin off those technologies that are close to commercialization while maintaining its core capabilities and strengths. This will permit us to assist in the establishment of private enterprises while continuing the basic, longer-term research and development that will enable us to meet the objectives of our national energy policy. In many ways, spinoff approaches address the motivation of "corporatization," because non-government funds could be provided to NREL creating a broader range of funding options.

I have initiated a preliminary review of the market readiness of NREL's technologies for producing fuels and chemicals such as oxygenates, octane boosters, and fuel extenders from biomass such as trees, grasses, and wastes. The initial finding is that several bioengineering-based products may be ready for evaluation as first-stage spin-out ventures. These might be commercialized as new startup companies or as new initiatives within the existing biotechnology industry, based on NREL's "biotech" people power and equipment. One approach we are evaluating is the establishment of an independent company that would have a separate board of directors, external financing, and a profit motivation. Such a venture would create high-tech business opportunities, encourage private investment for the technologies, and accelerate the testing of biofuels in the competitive marketplace.

To achieve such a "privatization of technologies" we need an environment in which we can act in an unencumbered, but professional manner to pursue the development and spinoff of technology and to improve the cost-effectiveness of our operation. Based on Secretary O'Leary's testimony of February 28, 1995 before the Subcommittee on Energy Research and Development of the Committee on Energy and Natural Resources and the Subcommittee on Energy and Water Development of the Committee on Appropriations of the United States Senate, we look forward to many improvements from DOE's ongoing strategic alignment. DOE plans to adopt best available business practices throughout the DOE and its laboratory system. We anticipate that this approach will be applied wherever practical across a wide spectrum of activities including finance, environment, safety and health, procurement, administration, and personnel management.

DOE could also enhance the efficiency with which laboratories operate and spin off their technologies, where appropriate and applicable, by giving each facility a much greater level of decentralized control and authority. This would help us pursue the concept of self-directed employee teams, which could focus on the best and most efficient ways of "getting the job done." And it would enable centers of excellence, such as NREL in renewable energy R&D, to have the flexibility and authority to develop and implement cooperative arrangements with other national laboratories, all of which would bring their strongest abilities together in a networked laboratory system to bear on the problems needing attention.

Conclusion

In conclusion, I want to reiterate that the Galvin and GAO reports have raised significant issues and have put forth important recommendations. I also want to emphasize that NREL is already operating in a manner consistent with the core themes of those recommendations. We believe that this method of operating has been important to our past success and will continue to be important to our success in meeting our mission – a unique, well-defined mission that focuses its work and guides the Laboratory in its endeavors. NREL is the world's center of excellence in renewable energy R&D. We have detailed plans that guide our development of technologies. And NREL is working hand-in-hand with industry to develop advanced renewable energy and related energy efficiency technologies.

NREL is committed to continually finding innovative ways to fulfill its mission and to improving its operations. Such is the case with NREL's intention to assume more of the tenor of a competitive business and to adopt best business practices.

I have outlined a concept whereby NREL as a DOE lab can adopt innovative business approaches that would enable it to more easily spin off technologies, streamline the process of technology development, and meet the long-term strategic objectives of DOE and the nation. I believe that such business approaches will enable us to better meet many of the Galvin and GAO recommendations, address the challenges posed by Secretary O'Leary's vision for strategically aligning the Department of Energy, and fulfill the broad directives of both the Congress and the Administration. Thank you for the opportunity to comment on the Galvin and GAO reports.

STATEMENT OF DR. WILLIAM MADIA, DIRECTOR, PACIFIC NORTHWEST LABORATORY

Dr. MADIA. Waive.

[The prepared statement of Dr. Madia follows:]

Written Testimony

of

William J. Madia
Director
Pacific Northwest Laboratory

Comments on the Report of the Galvin Task Force, "Alternative Futures for the Department of Energy National Laboratories" and the General Accounting Office Report, "National Laboratories Need Clearer Missions and Better Management"

Joint Hearing of the
Basic Research Subcommittee
and
Energy and Environment Subcommittee
of the House Committee on Science

March 9, 1995

Mr. Chairman and Members of the Subcommittees:

It is a pleasure to appear before you today to answer questions in support of your deliberations on the future of our federal science and technology infrastructure.

I wish to first thank Mr. Galvin and the members of the Task Force on Alternative Futures for the Department of Energy National Laboratories. In my interactions with Mr. Galvin and his team, I was continually impressed by the ability, commitment, and integrity they brought to this process. I also want to acknowledge Mr. Victor Rezendes and the staff of the General Accounting Office for their thoughtful report.

I bring two perspectives to this testimony. First, I am Director of the Pacific Northwest Laboratory, a multiprogram energy research national laboratory located in Washington state. Battelle Memorial Institute has managed the Pacific Northwest Laboratory for the Department of Energy and its predecessor agencies for the last thirty years. In 1994 the 4600 scientific and support staff at the Pacific Northwest Laboratory carried out roughly 1700 projects, primarily for the Department of Energy but also on behalf of other federal, state, and local agency and private industry sponsors. Second, before coming to the Laboratory last August, I served in a variety of management positions with Battelle, including laboratory director for our U.S. and European commercial laboratories and most recently leading the Institute's world-wide environmental business. Thus I also bring a strong private sector viewpoint, formed through twenty years with the organization that is credited with establishing the contract research and development industry.

In response to the Galvin Task Force report and the GAO report I wish to make a number of points.

Missions take precedence over governance

> The reports deal with two fundamental issues: the roles and missions of the laboratory system and laboratory governance. Of these, I believe we need to focus primarily on the missions of the laboratories; without important national missions to serve, governance issues are irrelevant. As a first point, missions of "National Laboratories" should be derived from national needs. Congress and the Administration set the agenda, and we are charged with developing solutions to the needs you define.

The laboratories have a set of vital, long-term, clearly defined missions

> I concur with the Galvin Task Force that the basic research, national security, energy, and environmental missions of the laboratories are relevant to national needs and vital to our future. I further concur with the Task Force that these missions, and the issues from which they derive, will require our attention for many years to come. I support both the

recommendations for increased integration of the energy mission and for the clearer definition of that mission along the lines suggested in the Task Force report.

Stronger focus on these missions is desirable, but must be created thoughtfully

I support the calls in the Galvin Task Force and GAO reports for increased mission focus in principle; however, care must be taken not to oversimplify. The appropriate model is one that ensures cross-fertilization between technical disciplines and encourages application of unique laboratory system capabilities derived from our core missions to related public needs. At both the Pacific Northwest Laboratory and at Battelle's private labs, some of our most important contributions have been made as a result of cross-fertilization of technologies between different missions or markets.

At the Pacific Northwest Laboratory our distinguishing signature is our strong focus on the Department's environmental mission. Our basic research programs are concentrated in the environmental sciences and environmentally relevant aspects of the chemical and biological sciences. Our applied research and technology development efforts are concentrated on DOE's environmental remediation mission, in the evaluation of environmental and health risk, and in the development of environmentally benign energy-related technologies. Our environmental programs, together with related basic research activities, represent roughly two-thirds of our work. The Pacific Northwest Laboratory also provides what our clients describe as high value, cost-effective contributions to DOE's energy and national security missions. Many of these contributions occur in technical areas related to our environmental work and our basic research programs or leverage technical capabilities developed in the environmental and basic research areas.

Industrial competitiveness is not a core mission

I also concur with the Galvin Task Force that "industrial competitiveness," or development of commercial technology, is not a core mission of either the laboratory system or of government in general. However, partnerships between the laboratories, academia, and industry are often necessary to achieve DOE missions and there are other circumstances where such partnerships deliver high value to the nation.

Just as we form numerous partnerships with academic institutions for basic research, the laboratories often form industrial partnerships to carry out our other missions more effectively. For example, in our environmental technology development programs at the Pacific Northwest Laboratory we have several industrial partners who contribute specialized expertise we would otherwise have to replicate at great expense. The flexibility to form partnerships with both universities and industry, when this is the most effective way to execute our core missions, is highly desirable and I believe such partnerships pose no public policy issue.

The DOE Laboratories have also entered into industrial partnerships directed primarily towards enhancing the technology base of a particular company or industry. This is the subject the Galvin Task Force has addressed, and it is here that public policy debates arise. I concur with the major recommendation in the Task Force report that wholly or partially government-funded, industrially-relevant R&D should have a focus that derives from the laboratories' primary missions and technical competencies. I further concur with the recommendations for increased flexibility on the part of the Laboratory Directors to initiate new technical projects and for competitive selection and technical review of cooperative projects. To these recommendations I add my strong view that this kind of cooperation is most effective when the entire resources of the laboratory system are matched with the needs of entire industry segments, as opposed to individual companies, to pursue broad, long-term R&D agendas. Single-company partnerships focused on commercial technology development should be avoided except where there is a compelling benefit to the government. I believe that the American Textile Industry partnership (AMTEX) and the broad partnership between the DOE laboratories and the U.S. automobile industry are examples of good practice.

DOE's environmental program needs more scientific input

> DOE's environmental remediation program requires a significant infusion of new science and technology if it is to achieve its objectives at acceptable cost and in a reasonable period of time. Much of the requisite expertise is readily available in the national laboratories. We at the laboratories must accept responsibility to provide real solutions at reasonable cost.

The Galvin Task Force addresses the remediation of the legacy radioactive and other hazardous wastes across the DOE complex at length. I concur with the Task Force analysis that the technical challenge is more than considerable and that we cannot solve the problem affordably with currently available technology. I believe that the Task Force prescription of an insertion of science and technology through the national laboratories is sound. Both fundamental knowledge, for instance elaboration of the mechanisms governing transport of contaminant material through the subsurface environment, and new technology development are required. The science and technology needs are largely in areas that match the core competencies of the laboratories. I believe senior DOE management has recognized the need for changes along the lines of those recommended by the Task Force.

Environmental science and technology is an important role for the laboratories

> To lessen the conflict between our requirements for economic growth and for a healthy environment we must prevent pollution at its source. Post-release cleanup is simply too expensive a strategy. Long-term science and technology programs are required to achieve this shift in our practice and are an appropriate part of the laboratory system's environmental mission.

The Galvin Task Force calls out the role of the laboratories in science and technology that moves us from a paradigm of environmental remediation to the far more desirable and affordable paradigm of pollution prevention and waste minimization. I concur with this view and with the Task Force's underlying analysis. Broad, long-term environmental technology and energy research and development programs as outlined in the report are our best possible insurance for our long-term economic, energy, and environmental security.

Laboratory governance must be improved

> Issues of governance and management effectiveness only become relevant after we reach clarity on the subject of missions. However, governance must be addressed if our institutions are to perform properly. The management issues identified in the Task Force and GAO reports are real, have significant cost and productivity implications, and must be resolved.

We should return to the original GOCO concept; "Corporatization" is not necessary

> Revitalization of the existing "Government-Owned, Contractor-Operated," or GOCO, management structure, properly and promptly executed, can address the very real management issues raised in these reports. In a properly implemented GOCO model, Congress and DOE define the mission needs and provide funding, while contractors are held accountable for delivery of results which they are free to achieve through application of best private sector practices. I strongly prefer revitalization of the GOCO model to the alternative of "corporatization." The quasi-public corporation proposed by the Task Force, with its Presidentially appointed Board of Trustees, does not appear to address the issue of government dominance as effectively as would a well-implemented GOCO structure. I have absolutely no doubt that revitalization of the GOCO is a far superior strategy to other possible approaches such as parceling out the laboratory system or its missions to a variety of other agencies. This latter strategy would be destructive to these institutions and the missions we serve.

Since the inception of the Manhattan Project the national laboratories and their precursor institutions have been operated through the "Government-Owned, Contractor-Operated," or GOCO, model. As originally instituted, the theory is simple. The Government, as owner of the laboratories, determines the results to be obtained, provides the necessary resources to obtain those results, and measures progress towards those results. Management contractors ensure that best private sector practice is brought to bear, so that the desired results can be obtained as rapidly and efficiently as possible. In theory, flexibility in personnel, procurement, and other administrative practices permits private contractors to achieve higher performance standards than would be possible if the laboratories were managed and staffed by government personnel and operated via federal government management practices. The record shows that when effectively implemented--as it was in the period from the end of the Second World War--this model works extraordinarily well.

Why, then, if the GOCO model is so effective, have we reached the point where a distinguished review panel recommends its abolition? The explanation is simple. The system as now operated bears little resemblance to the flexible partnership put in place decades ago. The Galvin report says, "Today the system has evolved to a virtual GOGO--Government-Owned Government-Operated, but certainly strongly government-dominated system." The GAO report also notes the proliferation of formal administrative requirements and aggressive expansion of oversight activity. Taken together, the Galvin and GAO reports vividly illustrate the point that detailed administrative requirements and intrusive oversight practices, far from protecting the interest of the taxpayer, have yielded high costs and low productivity.

The simplest, most straightforward solution to the management performance issues, and the one I support, is to revitalize the GOCO model in line with its original intent. I endorse the recommendations in Appendix B of the Galvin report as appropriate to achieving this revitalization. Congress and DOE must concentrate on defining the missions to be accomplished, identifying the resources required to execute those missions, and measuring progress towards desired end results. Contractor incentives should emphasize overall efficiency and productivity rather than conformance with government-specified management and administrative practices. In my opinion the recently initiated DOE efforts to eliminate or simplify Departmental orders and administrative requirements, if followed through to fruition, will be a promising start.

One issue that has been raised is that even if we improve performance through revitalization of the GOCO concept today, we may slip back into a situation of Congressionally mandated, DOE implemented micromanagement in a few years time, with all of the resulting costs and inefficiencies. The Secretary of Energy has expressed the intent to align the Department around its core missions and to adopt the recommendation of the laboratory directors to establish an Operating Board for the laboratories. Proper alignment around missions, coupled with the assignment of clear roles and responsibilities within DOE, is a critical step. Formation of an Operating Board focused on governance of the laboratories, if effectively implemented, could yield some of the advantages of the Galvin Task Force recommendation and would help to guard against re-emergence of the current management and oversight problems.

In making this recommendation for revitalization of the GOCO model to you I fully recognize the clear requirement for improved productivity. Strongly as I support the GOCO model, I do not believe your patience should be infinite. Should DOE and its management contractors prove unable to demonstrate substantially improved performance in a brief period, you may indeed feel compelled to examine more drastic alternatives along the lines recommended by Bob Galvin and his colleagues.

Substantial productivity improvements are possible

> **We can and will achieve a minimum of a 20% productivity improvement in the operation of the Pacific Northwest Laboratory. We are already making significant progress towards this goal with the active support and cooperation of DOE.**

No matter how compelling our mission, the Department of Energy and we at the national laboratories cannot escape our shared obligation to you and to the taxpayers you represent to deliver the highest quality, lowest cost product possible. Based on my experience in the private sector, I believe the overall level of cost and productivity in the laboratory system would not be accepted in industry. Far reaching and rapid change is essential. You should hold us accountable for dramatic improvement.

At the Pacific Northwest Laboratory, we are committed to obtaining at least a 20% improvement in productivity, as reflected in both lower total cost per hour for our scientists and engineers and increased value delivered for the hours they work. This is on top of the progress we have made over the last four years, during which we have steadily reduced our general and administrative rates. We have now engaged a well-known private sector consulting firm to assist us in bringing our management systems fully into conformance with best practice. The active cooperation of the Department, including the success of its change initiatives, and support from Congress in the revitalization of the GOCO concept, will be required for us to achieve the dramatic productivity gains and cost reductions we seek.

Market forces will deal with laboratory capacity issues

> Given clarity of mission, the question of whether there is excess technical capacity in the laboratory system can best be resolved by the market forces of supply and demand for that capacity. Allowing the market to determine capacity is a strong incentive for productivity improvement and cost reduction.

The Galvin Task Force suggests the laboratory system may offer opportunities for cost reduction through increased focus or reduction of activities. However, the experience of corporate America tells us that we should be careful about this assumption. Full-scale corporate reviews of internal capabilities inevitably identify areas where reduction is appropriate. However, in general they also identify areas where increased investment is required to maintain the core competencies and competitive standing of the business. A careful, technically-oriented review of the laboratories will almost surely identify areas where reduction is possible, but it will also find technical assets that can be usefully redeployed from past application and areas where increased investment is warranted.

If we ensure business-like practice in assignment of government research and development programs, and if we allow the laboratories appropriate flexibility in staffing and other management practices, market forces will naturally address the issue of capacity. Technical capabilities will be added, redeployed, or reduced in response to changes in the government's technology needs and, over time, capacity will shift to the most productive, best-managed institutions.

A vigorous federal science and technology effort is critical to our future

I recognize the enormous challenge to which you, as members of Congress, must respond. You are charged by the public with putting our fiscal house in order while maintaining government functions vital to the future well-being of our nation. As members of the House Science Committee, and of these subcommittees, you have a particular charge for the stewardship of that portion of our national science and technology infrastructure represented by the national laboratories.

I wish to leave you with the following thought. There is ample reason to believe that, over any extended period of time, the wealth of our nation and the prosperity of our people depends on a vigorous, continuing investment in science and technology. There are legitimate arguments over how best to organize and make these investments and over the appropriate roles of the public and private sectors. However, I firmly believe that a strongly-supported, federal investment in science and technology is a critical building block for our future.

The point is often made that our children will not thank us for leaving them a huge debt, and I agree. However, they will have even less reason to thank us if we also leave them bereft of the scientific and technical foundations they will need to build a prosperous and secure future.

STATEMENT OF DR. NICHOLAS SAMIOS, DIRECTOR, BROOKHAVEN NATIONAL LABORATORY

Dr. SAMIOS. The same.

[The prepared statement of Dr. Samios follows:]

Testimony of Nicholas P. Samios
Director, Brookhaven National Laboratory
before the Joint Hearing of the
Subcommittee on Basic Research
and
Subcommittee on Energy and Environment Galvin Report

March 9, 1995

Mr. Chairmen, members of both subcommittees, I am Nicholas Samios, Director of Brookhaven National Laboratory. I am pleased to testify today at this joint hearing on the report "Alternative Futures for the Department of Energy National Laboratories" (the Galvin Report) and the GAO report, "National Laboratories Need Clearer Missions and Better Management."

I am in agreement with the recommendations of both these panels, especially with the deep and thorough evaluations of the Galvin Task Force. Some if not most of the improvements and changes will greatly enhance the productivity and operation of the DOE's national laboratories. My concern is the implementation. It is timely and proper that such a review take place at this time when the Cold War is at an end, an era of truly global economic competitiveness is emerging, and the United States is facing a large national debt. As such, changes are expected, if not needed, and the national lab arena is no exception. My recommendation is that in this process it should be remembered that the DOE laboratory system as a whole is an immense national asset, and the national labs specifically are the so-called jewels. They must be preserved. At the same time it also should be understood that the laboratories are quite varied in their size, their missions and their capabilities. They are not monolithic. Therefore, I advise that a careful, deliberate and well-reasoned approach be taken in response to these reports, in contrast to any hasty over-simplified solutions. As pointed out by Galvin, many of our problems have arisen from short-term pressures that have come from both the Congress and every new administration. We need a long-term plan and the creation of an institutional memory, and now is the time do it.

Now let me turn to more specific issues. I agree with the Galvin Report's conclusion that national security, energy, environment and fundamental science are and should continue to be the core missions of the DOE labs and the industrial competitiveness should be a derivative of those core missions. I am also both pleased and in strong agreement with the Galvin panel's solid reaffirmation of the value of fundamental science. The report endorses the government's investment in large-scale scientific user facilities at the national labs to push the frontiers of science.

This is personally gratifying because that is precisely why Brookhaven National Laboratory (BNL) was founded and it remains the central theme of how we practice science. Our major facilities encompass the Alternating Gradient Synchrotron, which is the world's most intense source of protons in the billion-electron volt range as well as one of the premier facilities for heavy ion research. It has 800 users from academia and other labs performing forefront experiments in high energy and nuclear physics. The National Synchrotron Light Source presently has over 2500 users from industry, academia and national laboratories. The research encompasses material science, chemistry, biology as well as industrial concerns, such as catalyst development, microtechnology, and lithography. I consider this facility to be a premier example of lab industrial interaction in the research and technological domain. The High Flux Beam Reactor with about 300 users beautifully complements the capability of the Light Source by probing structures with intense beams of neutrons rather than light beams. As is evident, the design, construction, operation and use of large user facilities is a major activity at BNL, and a major fraction of our research activities are centered on these facilities.

A common theme of both reports, Galvin and GAO, involves the mission of DOE's national laboratories. This is indeed a valid concern in this changing world for the reasons noted earlier. Again, I would note the variation in mission focus among the laboratories, with emphasis ranging from pure research to national security, some modification in mission may be warranted. In this light, Brookhaven has had a focused mission from its inception involving large user facilities, basic research in a variety of disciplines, and response to national needs such as security and technology. While maintaining this mission, we have not been static. We have closed down older facilities as their leading-edge capability dulled. We designed and built new state-of-the-art facilities to help supply our scientific community with the necessary tools to push the frontier of knowledge.

I am also in agreement with the report's criticism of excessive oversight and micromanagement of the labs. I have been Brookhaven's Director since 1982. Over the past 13 years, I have witnessed a slow but steady climb in the number of rules and regulations applied to the labs. In fact, four years ago, I addressed that problem in an article I co-authored for the Atlantic Monthly Journal, which is attached to my written testimony for further reading. The labs have become grossly overburdened with detailed reporting and other paperwork requirements, many of which are pointless.

And this brings me to the issue of governance.

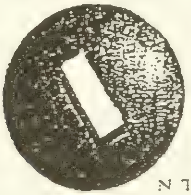
The Galvin Report says that the labs have in effect gone from GOCO to GOGO, from government-owned, contractor-operated to government-owned, government-operated. Disapproving of this management style, the report strongly recommends a corporate-style board under DOE, but with the authority to make decisions on how the labs should be managed. I do think this structure would be difficult to implement. The Task Force was foresightful, however, in writing Appendix B. Appendix B calls for a fallback position, one that affirms the GOCO concept, which was the original management structure for the labs. The key points of Appendix B are: basing DOE oversight on laboratory performance, consolidating DOE oversight offices, applying good business management practices, and managing lab infrastructure responsibly. I support the recommendation that the DOE get out of duplicating the regulatory role and rely instead on existing agencies, such as OSHA, EPA and NRC.

Finally, I applaud the hard work that the Galvin Task Force put into this report, and I challenge you to put in the time to digest and implement many of the important recommendations in the Galvin Report.

The United States showed the world how a government could foster the freedom required for basic science research, the results of which can be negligible or earthshaking. That freedom—and America's technological lead—have eroded at the same time

MANAGING THE UNMANAGEABLE

BY ROBERT P. CREASE AND NICHOLAS P. SAMIOS



IN THE FALL OF 1942 J. ROBERT OPPENHEIMER walked into the Presidio, in San Francisco, to undergo a physical. He was about to be tapped by General Leslie Groves, the head of a top-secret Army project, to establish and administer a classified laboratory in Los Alamos, New Mexico, that would investigate the possibility of developing an atomic bomb. Oppenheimer and his bosses took it for granted, given the source of the money, the lab's directive, and the need for security, that the facility would follow conventional practice and be militarized. Hence his trip to the Presidio: the physical would be the first step toward being commissioned a lieutenant colonel, which in turn would be the first step toward taking command of the largest and most ambitious scientific project yet attempted.

But Oppenheimer never went through officer training. He never needed to. Key scientists refused to come to Los Alamos under conditions of military hierarchy and bureaucracy, which, they said, were antithetical to the spirit of science. Scientists thrived when they were judged according to competence, not rank. Under pressure, Groves relented. On February 25, 1943, he sent Oppenheimer a letter promising that although the military would provide resources and general direction, for at least the time being Los Alamos would remain civilian, managed by contract with the University of California. Even Groves would come to recognize that this arrangement worked far more effectively than the original, conventional one would have.

The letter set a momentous precedent for relations between the U.S. government and its scientists. When, after the war, the newly founded Atomic Energy Commission set up a string of national laboratories, it chose to manage them according to a similar scheme, called administrative contracting, in which independent managers were hired, often universities or similar nonprofit organizations. The system was viewed as essential to the special environment needed for basic research, which, unlike applied research, seeks an understanding of the structures of nature for its own sake. Partly as a result, the United States forged ahead of other nations in postwar science and in the technology that derived from it.

Today that innovative and unique system is in jeopardy, threatened by a tendency to manage federal undertakings of all kinds, including scientific projects, as though they were businesses—constrained by business procedures and requirements and responsive to business incentives and pressures. Although we will focus on the problems of the national laboratories, owing to our familiarity with them, we believe that similar management problems are or soon will be experienced in connection with large government-sponsored scientific projects in other branches of science. The impact on science has gone virtually unnoticed by the public, because it has

ILLUSTRATION BY BILL NELSON

occurred in a series of tiny steps, no single one of which has been large enough to attract attention. But it is oppressively evident to those who work inside the national laboratories. The attempt to treat basic research as a business has slowly changed the structure and spirit of these laboratories, and begun to strip away the special protection this country once accorded them and to taint the fragile atmosphere needed for them to thrive. At a time of widespread lamentations about the loss of U.S. technological competitiveness, it is ironic that we are destroying one of the most important means by which we established that technological competitiveness in the first place.

Changing the World by Chance

ALTHOUGH BASIC AND APPLIED RESEARCH ARE OFten intertwined in practice, their intellectual missions are distinct. Basic research aims to recognize previously unknown structures of nature, whereas applied research aims to make some already known process possible or more effective. The structures of nature recognized in basic research may have practical applications, but whether they do or not, and if so of what type, are generally not the professional concern of the basic researcher. At the beginning of this century a popular postprandial toast around the Cavendish Laboratory of Cambridge University, in England, was, "The electron: may it never be of any use to anybody!" That wish, as the physicist Abraham Pais once wryly remarked, was unfulfilled. A few decades earlier, during an inspection of the Royal Institution, in London, a skeptical William Gladstone questioned the potential value of electricity. "Sir," came the waggish riposte, "someday you will tax it!"

The American sociologist Robert Merton once devoted an essay to what he called "the unanticipated consequences of purposive social action." Human action, he wrote, often brings about processes or results that are unintended by the actors, and these can affect either the actors or society as a whole, and can be beneficial or not. Although Merton was specifically discussing social action, his point is equally true of scientific research. But whereas most human action seeks to avoid unanticipated consequences, basic research courts them. Many discoveries are unsurprising, expected outcomes of deliberate research programs. Nevertheless, basic researchers are always aware of the possibility of—and often hope for—novel developments. The British theoretical physicist P.A.M. Dirac, who devised the "Dirac equation," which accounts in a comprehensive way for the behavior of the electron, used to say that his equation was smarter than he was, because it contained solutions to problems of which he was unaware. Moreover, historical illustrations of unintended practical consequences of discoveries are legion. We will cite a few examples to illustrate the mundanity of unforeseen consequences in discoveries of genuinely new structures of nature.

Improving medical techniques was hardly on the mind of the German physicist Wilhelm Roentgen as he tinkered with cathode-ray tubes in November of 1895. But when he explored the curious fact that a fluorescent screen near his apparatus was glowing, contrary to all expectations, he ended up discovering a wholly new phenomenon of nature, which he called x-rays. Within three months they had been used to examine bone fractures. His discovery triggered a series of other important scientific discoveries, such as that of radioactivity.

"I don't think the idea of helping suffering humanity ever entered our minds," Howard Florey, of Oxford's Dunn School of Pathology, once recalled of the moment in the late 1930s when he and his colleague Ernest Chain began a survey of antibacterial mechanisms. But on their list of microbes to study was penicillin, which had been discovered accidentally only a few years before but whose antibacterial properties had been neglected. Much of modern medicine is based on a substance whose discovery and development were matters of sheer chance and disinterested academic research.

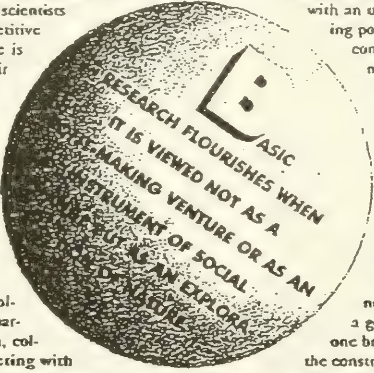
"Moonshine," responded the British scientist Ernst Rutherford, who discovered the nucleus in 1911, to the suggestion that energy might be obtained from it. Atomic energy was equally far from the thoughts of the Italian physicist Enrico Fermi when, in 1934, he began bombarding the nuclei of all known elements with neutrons, and was puzzled by the results he achieved with the heaviest known element, uranium. The German scientists Otto Hahn and Fritz Strassmann were trying to make sense of Fermi's odd results when, at the end of 1938, they announced that barium was a by-product of such bombardments. A month later two other German researchers, Otto Frisch and Lise Meitner, were only trying to explain *that* puzzling result when they suggested that uranium nuclei could split, or "fission," with a concomitant release of energy. The outcome of all this puzzle-solving, it hardly needs mentioning, transformed the world.

The unintended consequences of scientific research can reach far beyond science and technology, to have a cultural impact as well. One remarkable and well-documented example is the profound effect that telescopic astronomy had on Milton's poetry, and in particular on his imaginative depiction of the space of the universe in *Paradise Lost*. Some three hundred years later one might consider how x-rays, CAT scans, and radio telescopes have further altered human perception and imagination. It is unfortunate that the beneficial effects of scientific discoveries often become so thoroughly integrated into the world that they are taken for granted, as part of its warp and woof, whereas the pernicious applications of scientific discoveries are often portrayed as representative of scientific activity itself. Pessimists anticipate that basic research will deliver new forms of power to be socially abused; optimists anticipate a reform of social structures which will eliminate such abuses.

Temperamentally, scientists tend to be optimists, and if pressed will defend their work by saying that in the long run, at least, the effects of science are beneficial. But arguments about the value of basic research that are based on anticipations of either social utility or harm are weak, because they are based on analogy: the future will be like the past. A deeper motive for basic research is that it ultimately leads not just to understanding of the structure of nature but to self-understanding as well. What is nature? and Who are we? are not distinguishable questions. "Whatever nature has in store for mankind, unpleasant as it may be," Fermi once said, "men must accept, for ignorance is never better than knowledge."

An Odd System That Worked

THE PHRASE "MANAGING BASIC SCIENCE" MIGHT at first seem oxymoronic, like the oft-repeated jest about "military intelligence." Management is the effective coordination of resources and personnel toward a particular end; how can one coordinate an activity whose end is unforeseen and unforeseeable? Nevertheless, basic science stagnates when it is not effectively supervised. Salaries of basic scientists, for instance, are lower than those of applied scientists. Basic scientists cannot be paid competitive salaries, because there is no guarantee that their work is marketable; and even when it eventually happens to be so, the returns are usually too far in the future to affect them. Nevertheless, many extremely bright people find that the relative freedom to follow one's nose in preparing a research program, collaborating and competing with smart and dedicated colleagues, and the thrill of the prospect of making fundamental discoveries are ample compensation for unequal pay.



Creating and maintaining a healthy scientific culture is the aim of science management, and it involves tending to both the intellectual and the institutional conditions of basic research. The intellectual condition is freedom of inquiry—allowing and even encouraging scientists to follow new paths should they open up, to risk dead ends, to shift direction abruptly on a hunch. The institutional condition of basic science is a laboratory environment that facilitates such freedom of inquiry. A laboratory is more than a collection of equipment and the space to house it. It is a theater in which experiments are performed and witnessed, and like theaters of the more familiar kind, it is specially built for that purpose. Providing such environments was less complicated in the first few decades of this century, when scientists worked alone or in groups of twos and threes, when important laboratory skills were glassblowing and carpentry, and when one required no more than an ordinary room in which to perform an experiment. At that time laboratory equipment was workbench-sized and relatively inexpensive, and much of it was built by the researchers themselves; until the 1930s the first morning task for a physicist who needed power supplies often was to build batteries. With the Manhattan Project and the postwar establishment of the national laboratory system, however, all that changed. "Little Science" became "Big Science," in the words of Alvin Weinberg, a former director of Oak Ridge National Laboratory, in Tennessee. Researchers might work in teams not of twos or threes but of dozens and even hundreds; the cost of experiments reached not tens of thousands but hundreds of millions of dollars. Making equipment was subcontracted to industry, and the space to house it might require hangar-sized buildings.

Today Weinberg's phrase is unfortunately associated with an unproductive debate about science funding policy in which "Big Science" often carries connotations similar to those of "Big Business." The suggestion is that large scientific projects unfairly monopolize scientific capital, squeezing out the little guy who might make valuable innovations if given a chance. But the analogy is false. Knowledge generated by large scientific projects, unlike the profits of large corporations, becomes the property of the entire community and restructures the scientific background against which research teams large and small plan and execute new ventures. Moreover, "Big Science" is a general term whose meaning varies from one branch of science to another. It can refer to the construction of large instruments used by only a small fraction of the community at once, as in astronomy; large equipment complexes serving many individuals simultaneously, as in materials science; or the coordination of the work of numerous small research teams, as in biology. In each case the funding needs, the size and role of research groups, and the information flow between project users and the wider scientific community is different. It is thus meaningless to debate the value of Big Science in general; projects must be judged on an individual basis.

Nevertheless, the *management* problems of such large-scale projects are similar, and therefore the experience of high-energy physics, in which such problems were first felt, is likely to be emblematic. Big Science meant that high-energy physics outgrew the environment single universities could provide. The national laboratories had a special mission: to provide favorable environments in which such science could continue to grow. But the new scientific theaters had vastly different requirements from those of just a decade or so earlier. It was not simply a matter of bigger equipment, along with the need for more-extensive construction and planning. The new laboratories also required things like offices for procurement, maintenance, health and safety, security, architectural planning, and budget. They needed departments for photography, technical information, public information, and legal counsel. The commitment to maintaining such a large organization inevitably posed a threat to the freedom and flexibility of the basic research that was supposed to be carried out. Science management had become a problem—one that grew with the size of the laboratories.

The solution adopted was the administrative contract. Administrative contracts date from the era of the Atomic Energy Act of 1946, and the historic compromise it effected between the U.S. government and the U.S. physics community. The government was trying to balance its desire for a first-class scientific program with its desire for secrecy and control of the direction of nuclear-reactor technology. The physics community wanted the nuclear reactors and particle accelerators that were soon to become fundamental tools of Big Science, but also wanted to work independent of the government, which was the only conceivable source of funds. Administrative contracts permitted the government to participate in science while preserving the atmosphere of university laboratories.

Administrative contracts were soon written establishing several national laboratories, some through the reorganization of existing labs: Brookhaven National Laboratory, on Long Island, New York (the contractor was Associated Universities, Inc., a nonprofit group of universities in the region); Berkeley Radiation Laboratory, in Berkeley, California (University of California), now called Lawrence Berkeley Laboratory; Argonne National Laboratory, outside Chicago (University of Chicago); and Oak Ridge National Laboratory (built largely by Du Pont and now run by Martin Marietta). In addition to these basic-research facilities, a string of laboratories oriented toward military projects were also set up under administrative contract. Besides Los Alamos (University of California), these included Livermore Laboratory, in Livermore, California (also the University of California), now called Lawrence Livermore National Laboratory; and Sandia Laboratories, in Albuquerque, New Mexico (AT&T, through a subsidiary, the Sandia Corporation). When the contractor was a university or similar nonprofit organization, it received a management fee to cover its costs. Commercial companies came to receive an "award fee" along with reimbursement for their costs, in an amount depending on a judgment about the effectiveness of the management in any given year. The commercial companies participated not for the money but partly in order to contribute to the good of the country, partly to provide a training ground for employees, and partly to benefit from the transfer of new technology. The Sandia Corporation, for instance, has managed the Sandia Laboratories for forty years without any award fee.

The arrangement worked so well that when a group of European nations founded CERN, a laboratory in Geneva, in 1953, its management was patterned after the administrative contracts of the Atomic Energy Commission (AEC). "It is the desire of the Commission," a typical contract stated at the outset, "to procure for the Government managerial skill and responsibility which will permit flexibility in administrative controls and freedom from detailed supervision." Many of these contracts carried what became known as the sweetness-and-light clause: "It is the intent of the Commission and the Contractor that this agreement shall be carried on in a spirit of partnership and friendly cooperation with a maximum of effort and common sense in achieving their common objectives."

The special character of administrative contracts can best be seen by comparing them with the two most common types of government contracts, fixed-price and cost-plus-fixed-fee. Suppose, for instance, that the government wants to buy Army hats. It draws up specifications, determines which sizes and colors it wants, and then solicits bids. If the winner of the contract, a fixed-price one, cannot produce the specified hats on budget, it must bear the additional cost itself or renegotiate the contract. Cost-plus-fixed-fee contracts cover situations where the scope of the work precludes a basis for determining a fixed price. Suppose the government wants a series of metals to be evaluated for use in space vehicles. It might produce a detailed description of the tests it wants done, prescribing how long the process is to take, how often it will want to receive reports, and so on, and invite interested parties to negotiate a contract in which the government agrees to pay whatever costs are incurred plus a fixed fee. In both kinds of contracts the aim is to pin the contractor down to as many specifics as possible. Both presuppose a conventional buyer-seller relationship.

Administrative contracts envision an entirely different relationship between contractee and contractor, one that is essentially collaborative. It is taken for granted, for instance, that the relationship will be long-term; contractors are formally reviewed after five years but do not necessarily have to undergo a competitive rebidding process. Although the AEC determined its laboratories' basic direction, approved long-range plans, and played an important role in health and safety policies, other management issues were the responsibility of the contractor, who was allowed maximum flexibility in deciding them.

The Intrusion of Bureaucracy and Politics

ADMINISTRATIVE CONTRACTS WERE CREATED IN the knowledge that special management methods are required by the special environment in which basic research thrives. Yet the fruits of basic research—and their obvious ability to transform society—have made it tempting for the government to think that basic research can and should be managed for social ends, and that therefore conventional management models and methods can and should be applied to it. Little by little the government has succumbed to this temptation, and has come to adopt the perspective that basic-research facilities can be operated just like other corporate entities. The result has been to erode two fundamental kinds of independence originally granted to contractors: the relative independence from bureaucratic restrictions applied to other federal agencies, and the relative independence from political pressures.

The federal government long ago established a system of regulations to cover the contracting and purchasing functions of its agencies and any subcontracting carried out by those agencies. The reasons for doing so include the government's interest in preventing collusion, fraud, incompetence, and inefficiency, and its interest in promoting certain social ends.

The first administrative contracts, however, exempted the laboratories from such provisions. The promotion rules, salary structures, and personnel regulations of civil service were considered inappropriate to the laboratory environment. Because scientists on the research frontier need to be able to respond quickly to new developments, the elaborate accounting and procurement practices required of government agencies were also thought inappropriate. For such reasons, the contractors who managed the labs were bound by few of the restrictions that were standard in other government contracts, except for basic health and safety provisions. That is not to say that the contractors were given carte blanche; they were accountable for their work through periodic reviews whose conclusions were made available in publicly released reports. But the contractors were freed of the ordinary bureaucratic burdens placed on federal agencies.

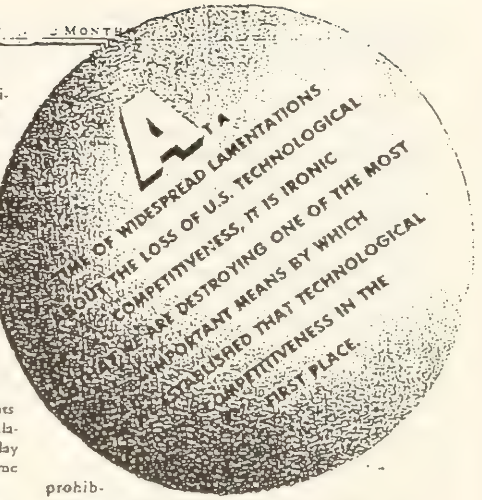
That freedom did not last long. Within a few years of the signing of the first administrative contracts many of the boiler-plate provisions of standard government contracts were being written into administrative contracts. These were not unreasonable, and contractors did not find them burdensome. But severer restrictions were applied, through a process known in the jargon as "flow-down," by which restrictive requirements and regulations in one contract tend to flow into others. The first flow-downs came through the AEC, which wrote procurement regulations into its standard contracts. It was often unclear both to the laboratories and to their Washington contract supervisors which of the AEC regulations had to be followed by the laboratories in subcontracting. The problem was exacerbated by the fact that the ultimate court of appeal for contract disputes with the government is the General Accounting Office, which had the right to examine all AEC contracts and subcontracts to evaluate their legality.

Over time the GAO's authority grew, as did the number of its regulations and the penalties for breaking its rules. Inevitably contractors began to play it safe and adopt the conventional contracting practices even when not technically necessary.

AEC procurement regulations were but one source of flow-down. Around 1960 a second source appeared with the creation of a set of federal procurement regulations. Once again, it was frequently unclear both to the laboratory managers and to contract administrators which regulations were to be applied to the administrative contracts; once again, the fact that the GAO had the final say discouraged the laboratories from making aggressive and flexible contracting decisions.

In 1975 the AEC ceased to be, and most of its functions were taken over by the short-lived Energy Research and Development Administration, which in turn was superseded by the Department of Energy, in 1977. The flow-down now became a torrent, thanks to a change in the character of the agency overseeing the laboratories. The AEC staff had always included a number of scientists who engaged in basic research, and the agency's five commissioners had always included at least one basic scientist. The professional staff of the AEC, like those of the Tennessee Valley Authority, the FBI, and a few other agencies, was exempt from civil-service requirements, meaning that it had a great deal of flexibility in selecting and assigning laboratory personnel. The Department of Energy, however, has never had a basic scientist at its helm, and is staffed largely by officials with little or no familiarity with basic research and its particular requirements. People arrived at the new agency with no awareness of the reason why administrative contracts had been established in the first place and no experience in handling them, and expected that the contractors who ran the national labs would follow the same regulations as everyone else.

In 1982 an advisory panel reported to the DOE that "the laboratories have become grossly overburdened with detailed reporting and other paperwork requirements, the utility of which frequently is not apparent and which unnecessarily divert resources from their research and development missions"; nothing, however, was done in response to the complaint. Similar conclusions were reached in subsequent years, with similar outcomes, by a presidential commission and a second advisory panel.



AT A TIME OF WIDESPREAD LAMENTATIONS ABOUT THE LOSS OF U.S. TECHNOLOGICAL COMPETITIVENESS, IT IS IRONIC THAT WE ARE DESTROYING ONE OF THE MOST IMPORTANT MEANS BY WHICH WE ESTABLISHED THAT TECHNOLOGICAL COMPETITIVENESS IN THE FIRST PLACE.

The result is that the national laboratories have to divert an increasing portion of their resources in order to satisfy federal bureaucratic provisions from which they were meant to be exempt. It is a question not of science administration having to grow in scale with the size of scientific projects but of the breakdown of the independence that the administrative-contract system was designed to safeguard. Three decades ago the procurement regulations that bound laboratories were available in a small booklet. Today each lab has several feet of "DOE orders," with additional ones arriving weekly. In the past ten years alone the budget departments at the national laboratories have doubled—not because they need additional help in preparing the budgets but because of the DOE's never-ending requests for information. Whereas agreements between contractors and the government aimed at a relationship of "sweetness and light" forty years ago, today the relationship is described as "at arm's length." Some examples:

- The DOE requires laboratory directors to approve each request for international-travel funds, and if the requests are filed within thirty days of the start of the proposed trip, they must be approved by the appropriate DOE offices in Washington. This regulation is absurd. Given the international character of contemporary science, international conferences are necessarily one of its important tools. Brookhaven scientists, for instance, make about 300 foreign-travel applications a year. DOE regulations require so much reporting and follow-up that the Brookhaven administration includes two people who work full-time to process applications.
- Following a recommendation of the 1982 advisory panel, the DOE established a program to provide lab directors with seed money for promoting new initiatives. The program has led to a number of important new research efforts that otherwise would have been delayed or abandoned. Last year, however, some scientists at Lawrence Livermore National Laboratory attempted to use the program to develop an idea to visit Mars using inflatable spacecraft. The plan completely bypassed input from NASA. Angered, Congress retaliated by eliminating the new-initiatives program. Ultimately it was restored, but with additional procedures and restrictions. Whatever one's opinion of space exploration, the story illustrates a bureaucratic tendency to punish all labs for an action at one.
- Last year Brookhaven couldn't get its integrated circuits made. Custom semiconductor chips are a component of experimental devices and instrumentation of all sorts. For a laboratory to have no new chips is something akin to a hospital's running out of penicillin. Integrated circuits are prohibitively expensive for a laboratory unless bought jointly with other institutions. When Brookhaven joined a consortium of others to acquire chips, however, some officials read the DOE requirements as prohibiting such a cooperative venture because of certain restrictions on submitting a purchase order to private industry. The laboratory spent a year tinkering with the agreement to make it valid, only then determining that the officials were merely playing it safe with the DOE requirements. Before the matter was straightened out, several major projects ground to a halt.

Revitalizing Scientific Culture

IT WAS ONE INTENTION OF THE ATOMIC ENERGY ACT to keep political hands off the basic-research budget as much as possible. One part of the act, for instance, provided for the evaluation and selection of research proposals by independent panels of scientists. Another sought to insulate the selected proposals and expedite the budgetary approval needed from Congress by the creation of a single congressional committee to oversee the basic-research budget, the Joint Committee on Atomic Energy—the only permanent joint committee with continuing legislative responsibility ever created. Many in and out of Congress were jealous of the joint committee's tremendous power. But throughout its tenure the joint committee respected the independence of the laboratories in conveying to the scientific community merely general areas of government concern, and insisting on the peer review of programs meant to address these concerns.

The demise of the AEC meant the eventual dissolution of the joint committee, which left the basic-research budget to be parceled out by a complex network of committees with overlapping jurisdictions. The absence of a single committee with a continuing vision exposed the basic-research budget to the political whims of successive presidential administrations. Laboratory programs established by one administration have been axed by the next.

Moreover, the parceling out of the basic-research budget also meant a growing vulnerability to pork-barreling, which can be defined as any non-peer-reviewed and -approved project. During the lifespan of the joint committee a few minor pork projects had made it into the budget, but the committee had aggressively kept the lid on. The lid opened, however, during the Reagan Administration. In 1982 George Keyworth, the presidential science adviser, apparently at the request of certain California constituents, attempted to bypass the peer-review process and insert funds for a National Center for Advanced Materials (NCAM, but soon referred to as NSCAM) directly into the DOE budget as a "presidential initiative." A $140 million project, it would have been the largest undertaking ever in materials science. A storm of protest led Congress to defer the project temporarily, but much of it has been reinstated.

After that episode Congress lost the restraint with which it had traditionally approached the basic-research budget. If presidential initiatives were possible, it was argued, so were congressional initiatives, and universities began to lobby Congress directly for them. In 1983 Cassidy & Associates, a lobbying firm, succeeded in getting Congress to earmark $5 million of the DOE budget for a chemistry building for one of its clients, Columbia University. The same year the firm snagged another $5 million for a vitreous-state research laboratory at Catholic University, in Washington, D.C. Cassidy has become the lobbyist of choice for universities. It is estimated that in the four-year period from 1982 to 1986 the funds earmarked for pork projects bypassing the peer-review process soared from $2 million to $236 million.

Behind the proliferation of bureaucracy and politics is a deep misunderstanding of the scientific process, in which basic research is viewed as essentially a corporate undertaking and hence something that can be manipulated for profit or social ends. Basic research flourishes—and society reaps the greatest benefits—when it is viewed not as a profit-making venture or as en instrument of social change but as an exploration of nature. To provide basic research with the special conditions appropriate to its execution amounts not to granting it a special status but simply to recognizing what it is and what are the conditions under which it should be done.

The hidden cost of imposing on basic research the same procurement procedures, budgetary constraints, and general regulations imposed on other areas of the federal bureaucracy is the sharp reduction of that flexibility which keeps basic research vital. We appear to be losing our technological leadership, and if we are not careful, we may lose our scientific leadership as well. It is true that the United States still holds the lion's share of science Nobel Prizes awarded since the Second World War. But we may be riding on past accomplis
The 1990 Nobel in physics was won by three Ame
for work done two decades ago, the 1989 prize b
American for work done in the 1940s, the 1988 prize
three Americans for work done a quarter century ago.
the past decade most of the physics Nobels awarded fo
recent efforts have gone to Europeans.

Recently the Department of Energy has taken some promising steps. In the current year's budget, for instance, it has recognized basic research in science as a category in its own right, which it calls "Fortifying Foundations"; in previous years the budget for basic research in science was classified under "Energy Research & Development." But much more needs to be done. We propose the following steps:

- Return to the original administrative-contract idea of flexibility and independence. For instance, the number of congressional committees through which the basic-research budget has to pass should be limited, and many accounting and procurement requirements eliminated. One cannot run science as a procurement activity.
- Establish a long-term science policy for basic research, identifying areas of interest and opportunity, and couple this with a two-year funding plan. The long-term policy would prevent the basic-research budget from fluctuating and make programs more effective by buffering them against the whims of Congress and of new administrations. A mechanism for establishing such a policy already exists, in the form of national science advisory and DOE committees; their mandate should be extended. Two years of funding cannot be guaranteed, since Congress makes only one-year appropriations; nevertheless, planning funding according to that time frame would be an improvement over the present system. Since congressional project additions are a way of life, they will continue. However, they should be budgetary add-ons and not come at the expense of ongoing programs.
- Reduce the number of DOE orders to laboratories, and end the bureaucratic mentality that formulates a new rule following every offense. Much more effective would be to treat the individual case first. Each DOE institution—and, indeed, each of the national laboratories—is unique. Each has different facilities, skills, styles, personnel, problems, and goals. A solution to a problem at one lab may not work and may even be harmful at another.

Genuine scientific culture, like all human culture, is achieved through organic growth rather than the execution of a plan. One cannot suddenly decide to buy a forefront scientific program and then go out and exploit it. Do we demand of basic research that it be of potential social or military use? Do we insist that it pay for itself? Or do we try to foster in those who do science the ability to follow their intuitions about how the world works? On the answers we give to such questions depends the future of science in the United States. □

STATEMENT OF DR. ALAN SCHRIESHEIM, DIRECTOR, ARGONNE NATIONAL LABORATORY

Dr. SCHRIESHEIM. Waive.

[The prepared statement of Dr. Schriesheim follows:]

Written Testimony

of

Alan Schriesheim, Director

Argonne National Laboratory

Before the

Subcommittee on Basic Research

and the

Subcommittee on Energy and Environment

of the

Committee on Science

U.S. House of Representatives

March 9, 1995

Written Testimony
of
Alan Schriesheim, Director
Argonne National Laboratory

Before the
Subcommittee on Basic Research
and the
Subcommittee on Energy and Environment
of the
Committee on Science
U.S. House of Representatives

March 9, 1995

Introduction

Mr. Chairman and members of the Subcommittees, I am Alan Schriesheim, Director of Argonne National Laboratory. I am pleased to comment on the report of the Task Force on Alternative Futures for the Department of Energy National Laboratories, which was chaired by Bob Galvin.

First, we congratulate Bob Galvin and the Task Force for an outstanding report. The analysis is penetrating; the findings are accurate; and the recommendations, direct and bold.

Galvin unveiled the report at a public meeting of the Secretary of Energy Advisory Board meeting on February 1. I think everyone present at that meeting, including the laboratory directors, were struck by the precision and directness of Galvin's presentation and by his evident grasp of the structure and workings of the laboratory system. Clearly, he and the Task Force had done their homework.

For the Task Force, much of the homework was done away from home. Galvin led Task Force visits to each of the multiprogram laboratories. He visited Argonne twice. The second review was called the "Super Visit," because eighteen of the twenty-three Task Force members were able to attend.

It is my impression that of all the reviews of national laboratories over the past two decades, the Galvin review is clearly the best led, the most cogent, and the most deserving of congressional attention.

My comments on the report are divided into two parts: laboratory missions and laboratory governance. The comments address the main findings and recommendations of the Task Force report.

Laboratory Missions

I am pleased that the Task Force has strongly reaffirmed the Department of Energy's core missions in the areas of energy, environment, national security, and fundamental science. Like the Task Force, we believe there is a compelling agenda of important work to be performed in these traditional DOE mission areas.

The Department's programs in fundamental science are strongly endorsed by the Task Force. The report notes DOE's special role in constructing and operating large national research facilities. The Department is keenly aware of the importance of this role. Three weeks ago in another hearing before the Energy and Environment Subcommittee, the Director of DOE's Office of Energy Research described the Department's Scientific Facilities Initiative for FY 1996. I strongly support this initiative to improve the availability of these facilities for industry and university users.

In energy technology, the Task Force calls for greater integration with and support from DOE's basic research programs and better coordination among the energy technology programs themselves. The Task Force also recommends greater coordination with industry's research and development efforts. On this point, there appears to be some confusion. Several reviews of the Task Force report have interpreted the recommendation that DOE concentrate on long-term research to imply less involvement with industry. A closer reading indicates that the Task Force urges DOE and its laboratories, at least in the core mission areas, to develop even closer ties with industry. I concur with all these recommendations regarding energy technology.

The Task Force recommends that the laboratories continue to be involved in nuclear fission-related R&D. Because of my laboratory's expertise and long history of accomplishment in this area, I was naturally gratified to see this recommendation.

The Task Force report pays considerable attention to the symbiotic relationship between energy and environment technologies. Whether described in the language of traditional economics, or "sustainable development," or "industrial ecology", the global problem of how to achieve economic growth in an environmentally acceptable manner has become a matter of high national policy in most developed countries. I believe DOE and its national laboratories, because of their work in energy and environmental technologies and their ability to bring multidisciplinary skills to bear on complex national problems, are uniquely qualified to inform U.S. policy and to contribute to the national R&D agenda in this area.

The Task Force is not sanguine about an expanded role for the Department and its laboratories in the general area of industrial technology. I accept this position with the understanding that the laboratories can continue to apply technologies developed under their core missions to other industrial uses where the applications are obvious and direct and where they do not entail substantial additional research. The national laboratories should not try "to make careers" out of these other areas of technology applications.

Laboratory Governance

The Task Force concluded that a "bold alternative" is needed to correct the present DOE system of managing the laboratories. In the report's words, "the current system of governance is broken and should be replaced." The Task Force's alternative is indeed bold. It recommends that Congress authorize "a far-less-federal system," specifically, a not-for-profit corporation to manage the laboratories. The corporation would be governed by a Board of Trustees.

I agree with the Task Force that the government-owned, contractor-operated (GOCO) system has acquired a burden of excessive oversight and micromanagement. Here, I would distinguish, however, between DOE's management of its research programs and its oversight of operations and administrative functions at the laboratories. Once policy direction has been set, the Department generally does a commendable job in its research programs and in coordinating activities across the laboratories. DOE's oversight of operations and administration functions is the problem.

I believe Galvin's corporatization proposal is a fresh vision of laboratory governance that merits consideration. Meaningful discussion will require fleshing out a range of alternatives. At the same time, there is every reason to move quickly and decisively to rejuvenate the GOCO relationship. Appendix B in the Task Force report provides a very good set of recommendations for directing this process.

The Department acknowledges the major problems with laboratory governance identified in the Galvin report. It has developed a "Management Improvement Roadmap," which addresses the most pressing problems with DOE oversight. And it is chartering a "Laboratory Operating Board of Directors" to supervise implementation of the Roadmap. These steps are promising. But, as usual, the devil is in the details. The Laboratory Operating Board will need real perseverance and dedication to the tasks at hand.

One of the most important and urgent of the steps DOE could take in the short run to improve the GOCO system is to move from DOE regulation of its laboratories to regulation by EPA, OSHA and NRC. Such external regulation should substitute for DOE self-regulation, not add to it. It may not be feasible to shift regulatory functions for all operations at all the laboratories to other federal agencies. But for most operations this approach is entirely workable. At Argonne, I believe it would be straightforward to isolate those few operations where DOE regulatory oversight might still be necessary. We would be happy to serve as a test bed for such a new approach.

As an executive whose own roots lie in a large private corporation, my judgment about how to improve laboratory governance resonated with the paragraph in the Galvin Task Force report in which the following key sentences appear:

> The government should be the customer of the laboratories ... a world-class customer. World-class commercial customers do not tell their suppliers how to do things.

I am hopeful that the Task Force report will motivate a revitalization of the GOCO system. But the time to test my hope is now. Congress must be a primary supporter of this process if it is to succeed.

STATEMENT OF DR. CHARLES SHANK, DIRECTOR, LAWRENCE BERKELEY LABORATORY

Dr. SHANK. Waive.

[The prepared statement of Dr. Shank follows:]

Joint Hearing of the
Basic Research Subcommittee
and
Energy and Environment Subcommittee
# of the House Committee on Science

March 9, 1995

Charles V. Shank, Director
Lawrence Berkeley Laboratory

Mr. Chairman and members of the Subcommittees, I am delighted to provide these comments on the report of the Secretary of Energy Advisory Board Task Force on Alternative Futures for the Department of Energy National Laboratories. As Director of the Lawrence Berkeley Laboratory, in Berkeley, California, I want to express my appreciation for the leadership and integrity of Bob Galvin in forging this report. The principal findings of the report are likely to have a significant impact on the operation of the Department of Energy and its laboratories. I welcome many of the recommendations, particularly those that validate the mission of our laboratory and which lead to an increase in our operational efficiency.

In this statement I will discuss the energy mission of the national laboratories, including the role of technology transfer, and the governance recommendations.

Throughout the Galvin Report, the importance of energy, and of the energy mission, is highlighted. "Energy is so central to the vitality of our ... country that it has to be a priority concern as an ongoing national strategic issue." Today, more than half of the oil consumed in the United States is imported and paid for with borrowed money in the form of national trade deficits. Our future security depends on a scientific foundation that underpins national interests. The report properly asserts that there is a compelling research agenda in the Department of Energy core mission areas: energy, environment, fundamental science, and national security, and concludes that the DOE national laboratories are part of "an essential, fundamental cornerstone for continuing leadership by the United States."

I am in agreement with the report's conclusion for a refinement of the missions of the multiprogram laboratories. The energy mission includes a broad range of scientific activities ranging from materials, computational modeling to health effects that justify the multi-program activities at the laboratories. We are seeing the most exciting scientific advances occur at the boundaries between fields. For example, the scientists that developed the world's most advanced detectors in high energy physics have teamed with biologists to produce the most effective robotics systems for efficiently sequencing the human genome. This synergy between programs is readily apparent in the multiprogram Laboratories' contributions to medical imaging, advanced materials, and the next generation of energy technologies.

In my view, the Galvin Report has correctly described technology transfer as a derivative mission of the laboratories, and not a stand-alone mission of the Department of Energy. The laboratories have an important role in leveraging the investment made in energy research to create value for the economy.

At Lawrence Berkeley Laboratory, several of our scientific programs benefit from strong coupling with programs at campuses of the University of California, particularly Berkeley. The Galvin Report encourages closer laboratory-university cooperation in basic research, a recommendation with which we strongly agree.

One of the most dramatic and far-reaching conclusions of the Galvin Report is its extensive criticism of the Department of Energy governance of the laboratories. I concur with the assertion that "...the current system of governance...is broken...." There is blame enough for everyone. The root cause, I believe, is that after fifty years of responding to anecdotal events with "one size fits all solutions," we have arrived at a governance structure that is over constrained, inefficient, and largely unworkable. Despite the governance burden, the laboratories have been remarkably productive, and the Government-Owned, Contractor Operated (GOCO) system has played a key role in enabling the laboratories to deliver a quality product.

It is essential that, as new forms of governance go forward, they not be allowed to harm the GOCO relationship. The Galvin Report proposes a "corporatized structure" for operating the laboratories, and if this is not feasible, recommends implementation of the report's "Appendix B" blueprint for fixing the current governance system.

The corporate framework proposed by Mr. Galvin is a very thoughtful effort to create an operating environment for the laboratories that isolates them from the federal process that has resulted in so many problems. Unfortunately, I do not believe that such a structure will prevent governmental interference any more than the present system does. Also, an unintended consequence of the proposal could be to make the laboratories more remote from the program needs of the Department of Energy.

I believe that "Appendix B" forms a firm basis for restructuring the DOE governance of its laboratories. I support the proposal of the Secretary of Energy to create a "DOE Laboratory Operating Board" of senior DOE managers and private sector advisors. The board would provide a forum for surfacing systemic problems and for addressing inefficiencies. Through such a mechanism, the goal of cost-effective, efficient oversight of the laboratories could be realized.

The Department of Energy has begun an aggressive restructuring program to respond to the challenges in the Galvin Report. Along with Directors Narath and Peoples, I am a member of the Steering Committee for the Strategic Alignment effort. I see a renewed commitment on the part of DOE and its laboratories to radically improve the GOCO management system, with the goal of providing world-class science efficiently and cost-effectively.

In summary, I see the Galvin Report as making an enormously important contribution to the continuing vitality of our national laboratories.

STATEMENT OF DR. ALVIN TRIVELPIECE, DIRECTOR, OAK RIDGE NATIONAL LABORATORY

Dr. TRIVELPIECE. I would like to use an approach to this which is perhaps a little different. If you live up in the northern tier states and you fall in a very cold lake, you may end up being taken to an emergency room. It used to be quite frequently that people were taken away for autopsies and it was discovered they were still alive. This has led to an emergency room procedure which is that you're not dead until you're warm and dead.

In the comments related to Mr. Galvin's suggestion on corporatization, I'd like to point out that the GOCO concept has been kept under cold water without oxygen and warmth for some period of time. It may be dead.

On the other hand, perhaps getting it warm and dead before something else is done might be a good step. I would like to see a serious effort made to improve the GOCO system before going to the full extent that Mr. Galvin suggests. So I'd like to see us warm and dead before somebody declares us dead.

Thank you.

[The prepared statement of Dr. Trivelpiece follows:]

Testimony of

Alvin W. Trivelpiece
Director
OAK RIDGE NATIONAL LABORATORY

ALTERNATIVE FUTURES FOR THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES "THE GALVIN REPORT" AND NATIONAL LABORATORIES NEED CLEARER MISSIONS AND BETTER MANAGEMENT

Report to the Secretary of Energy
United States General Accounting Office

before the
SUBCOMMITTEE ON BASIC RESEARCH
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

March 9, 1995

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
Managed by
Martin Marietta Energy Systems, Inc.
for the
U.S. Department of Energy
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Mister Chairman and Members of the Subcommittees, the Report of the Task Force on Alternative Futures for the Department of Energy National Laboratories contains many interesting findings and recommendations. Mr. Robert Galvin, who chaired the Task Force, is to be commended for the thorough job that he did in leading this effort. Secretary of Energy Hazel O'Leary is to be commended for recognizing the need to have such a study conducted, and for selecting Mr. Galvin to lead the effort. The Report deserves careful consideration and contains recommendations that if followed would substantially improve the operation of the Department of Energy and the effectiveness of its system of national laboratories.

In my opinion, the laboratories have not received proper credit for many of the key scientific and technical contributions that they have made over the years, and by the same token seem to be blamed for problems that they didn't cause. In that regard, I suppose that nothing is ever truly fair, and one shouldn't complain about such matters. Even so, the Galvin report offers us an opportunity to examine how the Department has evolved from the Atomic Energy Commission to its present-day situation and ask whether the way it does its business through its laboratories could be improved to the benefit of the nation. I believe that the answer to this question is a clear yes. There are many improvements that could and should be made in the way that the Department operates! I also believe that, in spite of popular pressure to the contrary, most of the functions of the Department are essential and that doing away with the Department and scattering its functions to other agencies is not a well-conceived idea and should be abandoned. This is not to say that these functions could not be performed more efficiently or that they require the existing level of federal or contractor work force to carry them out. Rather the focus should be on improving the operation of the Department and its laboratories by implementing many of the recommendations of the Galvin Task Force.

Although I do not agree with all of the recommendation made by the Galvin Task Force, I do agree with many of them. I don't believe that we as lab directors have any basis for saying that we did not have a fair hearing by the Task Force. Each of us had many occasions to meet with the individual members of the Task Force and its subcommittees. Each of our institutions was visited by one or more of the subcommittees of the Task Force, and by a group lead by Mr. Galvin personally. We were not in any way constrained by the Department or by our contractors regarding what we could say to the Task Force.

One of the benefits of establishing any task force or review is the process itself. Preparing for the visit of the Galvin Task Force caused us to clarify our thoughts about what we do and why we do it. We worked hard to define our core competencies in such a way that we could explain them to the Task Force. In the process we learned a great deal about what is important to us. We have examined some of our overhead functions, and for those for which we have some ability to control, we have already reduced costs. The process helped us in identifying some of the areas in which we have no control over costs that result from regulation or from excessive bureaucratic burden. We are working to negotiate changes in those circumstances where regulations and orders may no longer be needed. The process has sharpened our thinking about how we might be better able to operate as a system of laboratories cooperating where appropriate and not competing when that is counterproductive. We have started a process to explore how we might go about creating cooperative arrangements that are virtual laboratories in certain areas where our cooperation would work to the nation's benefit.

The process of preparing for and participating in the activities of the Task Force has caused the lab directors to meet as a group several times to discuss our problems and to search for ways by which we might cooperate more effectively than we have in the past. By the same token, the activities inside the Department have anticipated some aspects of the Task Force's findings and recommendations and some changes are underway at the present time.

The Galvin Task Force recommends a system of governance that would bring in an outside board of directors that would in effect separate the Department from the management of its laboratories. I do not agree with this recommendation in general. I believe that the Government Owned Contractor Operated (GOCO) approach used by the Department of Energy and its predecessor agencies has served the nation well. That is not to say that there are not problems with the system that are crying for correction. Appendix B of the Task Force Report is a good set of goals and guidelines that if implemented as appropriate would result in a substantial improvement in the functioning of the Department and its laboratories. The DOE laboratories should be national labs in more than name only, they should be able to accept appropriated funds from other federal agencies directly, and they should be more autonomous. However, separating from the Department entirely does not seem to me to be a good idea. I believe that a much better approach is to have the Congress and the Administration work to improve the GOCO system and to use it in the manner that it was originally intended. It would be a much more efficient system and would take advantage of private sector approaches to operations. I am encouraged that the Department has taken steps to do just that. Based on my experience, I am just a little cynical about the ability of any federal agency to follow through and carry out reforms from one administration to the next. There are many ways by which such continuity and stability might be introduced into the system. For instance, the formation of an operating board along the lines that Secretary O'Leary has proposed would be an excellent first step. Another constructive action would be requiring that the directors of the DOE labs form their own organization to meet and consider matters of operation and program that would improve the functions of the Department. It is not that anyone has all the answers at the moment, but rather that it is imperative to institute a process that will result in a strong and effective system of national laboratories.

Congress must also look to itself to understand some of the problems that the Department is now confronting. Cost overruns in certain projects have been a contentious issue. In planning a project, the Department conducts extensive efforts to determine the cost versus time profile that results in the lowest total cost. When the level of funding appropriated for the first year does not match that profile, costs grow in later years. If the funding continues to fall short of levels proposed in the original project documentation, then costs begin to grow. Then the Department is criticized for failing to control the costs. New controls are put in place to help control the costs, which ironically usually further add to the costs. This is not to try to fix blame or absolve any of the parties involved. But it is a plea to be able to have effective long-range planning for scientific and technical programs with budgets that are stable over the lifetime of the projects. This may mean funding such projects by giving them full authorization up front as is done with certain military procurements.

One of the other problems we confront stems from the one-size-fits-all approach to regulation. The need to have effective regulations concerning the handling of special nuclear materials is clear. Extending that discipline to the control of household chemicals at national laboratories does not lead to improved worker or public health and safety, and it certainly does not lead to reduced costs. Excessive proscriptive regulation needs to be examined in the light of common-sense health and safety requirements.

There have been charges in the past that the DOE national laboratories are somewhat insular and do not interact with our nation's academic and industry communities. That may have been true in the past, but it is not a correct picture of the present situation. For example, last year, over 4000 guest scientists and engineers stayed at ORNL for two weeks or longer; 30% of these came from industry. Of ORNL's publications in scientific journals, almost 70% are now co-authored with members of other institutions. We have numerous research and development subcontracts with industry because we find that their expertise is frequently the best to fulfill the task as outlined by the Department of Energy. ORNL, like other national laboratories, has representatives from industry and academia on its review boards. The current situation, where partnerships and interactions are encouraged, differs greatly from what was government policy only a decade ago. I believe the progress that national laboratories have made demonstrates that the federal government and private industry can work together to address technology constraints that inhibit the ability of U.S. industries to compete effectively.

Developments from the national laboratories have directly benefited the private sector and led to significant technology deployment. I believe this is a winning situation for everyone involved. The work of the laboratories increases our nation's competitive advantage because we can supply a product that aids in the growth of the Gross National Product. The company that licenses the technology benefits because of dividends to shareholders. The company's employees benefit because jobs are created and the revenue gathered by local, state, and the federal governments increases because of the increases of jobs.

This does not mean that improvements in government/academia/industry interactions cannot be made. I believe it is important to rescind requirements for advance payments for use of user facilities and cooperative projects. The imposition of advanced payment is counterproductive to increased use of the resources of the national laboratories by other organizations. In addition, added factor fees should be waived on R&D performed at the national laboratories for government agencies other than Department of Energy. A memorandum of understanding has been signed with the Department of Defense to reduce these fees. Similar agreements with other agencies would allow the national laboratories to serve the national interest in a more cost-effective manner. One barrier to access to the expertise of national laboratories from other government agencies was eliminated with the passage of the National Defense Authorization Act last year. Part of this legislation involved extending personnel exchanges under the Intergovernmental Personnel Act to all Federally Funded R&D Centers, and not just those national laboratories operated by nonprofit organizations.

There has been a great deal of public discussion about the role and mission of the Department of Energy's national laboratories. I find the discussion regarding a mission statement in the prepared testimony of Dr. Burton Richter, director of the Stanford Linear Accelerator Center, to be excellent and wish to go on record as endorsing it.

In summary, I believe that the Department of Energy should continue as a cabinet agency, but that in the process of implementing some of the recommendations of the Galvin Task Force, substantial improvements in its operation and in its stewardship of its national laboratories could be made. Moving to exclusively external audits, controlling the audit functions to a reasonable level, funding the laboratories on a more wholesale basis, and placing greater responsibility and accountability for the nature and conduct of the work at the labs given on the laboratory directors are but a few items that deserve consideration.

Mr. SCHIFF. As we would say on this side, I'd like to associate myself with your remarks.

I think we've retreated from the GOCO contractor operated approach, incremental over the last number of years, and I think we need to go back and restart that idea and give it another try before we abandon it completely.

If there are no further opening statements, I'd like to proceed directly to questions. I'm going to make this open-ended and maybe Dr. Trivelpiece answered it in advance.

But you all, of course, are aware of the subject matter of this hearing. You are, of course, aware that this Subcommittee and the Subcommittee on Energy and Environment are studying the Galvin Commission Report and its affect on your institutions.

I would just like to open endedly, but perhaps a little briefly, because of the size of the panel, just ask your reactions to the Galvin Commission Report, as you see it. Again, I'll begin over here.

Dr. Denson?

Dr. DENSON. I thought the report was excellent. I did not agree with the governance part of the report. I don't think it's workable. I do agree with the Secretary's approach where we build an internal board of the Assistant Secretaries and outside members to better focus and integrate the National Labs toward the functions we're supposed to achieve.

I strongly recommend that we move forward with Appendix B of the Galvin Report, which will, as Dr. Trivelpiece said, help fix a broken GOCO model.

Mr. SCHIFF. Dr. Gay?

Dr. GAY. The first remark I'm going to make is that we heard the Galvin and GAO Reports. We agree with the spirit and the general character of the reports. At NREL, we're already doing a lot of the things that are recommended in those reports.

I'm new here on the job. This is the beginning of my fourth week, but I'm pleased to see that the DOE is already very proactive about implementing the recommendations and facilitating the efforts that we have identified out at NREL in the short time that I've been there. Looking at ways that we can make a lot of the spirit of the recommendations identified there happen within our operation, we have the focus and the organizational ability to get moving on this process, and I'm looking forward to doing that.

Mr. SCHIFF. Dr. Madia?

Dr. MADIA. Mr. Chairman, we, too, strongly support the general conclusions derived in the Galvin Report, especially those that dealt with the four core missions of the Department. We fully subscribe to those four as core missions.

In addition, we believe industrial competitiveness, and I will call it economic productivity, should be a derivative mission of those four core missions. Those are major points that we agree with.

With respect to the governance issue, I think I speak for many of us. The Appendix B approach we strongly support with one strong rejoinder, that being aggressive implementation of Appendix B is essential.

We shouldn't dally on this issue for a long period of time. We should get to it as soon as possible.

Mr. SCHIFF. Dr. Samios?

Dr. SAMIOS. I think the report is a breath of fresh air. I would say he tackles many of the big issues. I'm concerned about the over-attention to the governance issue. As a result, I hope the Committee really reads the report, as Mr. Galvin has asked, to see the frustrations we've had in the last year.

I think your comments earlier on that we've gone from a GOCO to a GOGO over these many years was well taken. And I support, that's been said before, to really try the GOGO concept. I of course agree with the four business areas and the technology being derivative. Having been around a long time and seen many panels come and go, I am cautiously optimistic.

I would again reiterate Mr. Galvin's comments, with some trepidation, paraphrasing Shakespeare—the problem has not been with the labs, but has been with Congress and the DOE.

Galvin said—I'm quoting Galvin—so you should take that seriously. So I'm very concerned about the implementation, hasty implementations without really understanding how one is going to deal with these jewels of long-term research and national security, and so are the issues.

So I'm reserving judgment. I hope this time around, I'm better off after such a panel has reported, than before. It has been contrary to that, every other panel that's come by during my generation as a director.

Mr. SCHIFF. Dr. Schriesheim?

Dr. SCHRIESHEIM. Like Dr. Samios, I would hope that considered judgment is given by Congress to the reports and recommendations and that some really thoughtful work goes into what should be done in addition to what is doable. Because those two issues really are separate. Sometimes we work on what's doable and we don't work on what it is that we should do. So there are a lot of items that are in that report that bear on what it is that should be done with the institution, and when I say institution, I mean the total, the total ball of wax there, what should be done to make it as efficient and effective as possible. And it's the "should" that we really want to work on.

I guess if I had to sum up my feelings, there's a statement in the report that I can't resist quoting. That is that the government should be the customer of the laboratories, a world class customer. World class commercial customers do not tell their suppliers how to do things. That's the trap we're in today. So thank you very much for the opportunity to make some statements.

Mr. SCHIFF. Well stated, Dr. Schriesheim.

Dr. Shank?

Dr. SHANK. I too would like to express some great appreciation for the report and believe that the Galvin Report will have a significant impact on the things we do. In particular, I'm very much in agreement with the report, having identified energy as an important mission and a strategic activity for the country, and that the laboratories play an important role in that activity.

As we look to the areas of interactions with other institutions, with the universities, particularly in our laboratory, we have a very close relationship with the university. I applaud that support for coupling and working with academic institutions. I applaud the support for fundamental science.

With respect to the governance issue, one of the things that has not been said, but I believe is very important, is that the GOCO relationship has survived at this point. I think the reason we're here having this discussion is because of the quality of the work the laboratories have performed.

I think that the institutions that really have had a passion for our output, have really been the GOCO management organizations.

Our struggle with the administrative aspects should not overshadow the value that the GOCO relationships have brought into the quality of what we do.

I have this hope and this vision that we may see laboratories that are run much like the laboratory that I spent 20 years of my life in before joining Lawrence Berkeley Lab. I was 20 years at AT&T Bell Laboratories. They are a measure of performance, which I think I would really love to see us think about, is that as we look to administrative and operational activities, we would make sure that every one of them brings some value added. I think that cost effective oversight is very important to us, and it's very important to you as we drive to common sense and cost effectiveness. I believe we'll deliver more for the dollars that are being spent in our laboratories.

Mr. SCHIFF. Dr. Trivelpiece?

Dr. TRIVELPIECE. I echo my colleagues' comments.

I don't have anything of substance to add beyond what they've said, other than the praise of Mr. Galvin and his report. I do hope that it provides us the opportunity to make changes that are long overdue.

Mr. SCHIFF. I thank you all.

I want to say that I know we have two of our Ph.D. holders in the Congress waiting for you right now, so I think it's appropriate to recognize Mr. Bartlett from Maryland for five minutes.

Mr. BARTLETT. Thank you very much.

I was just going to observe that maybe it was significant that the only two Committee members who remain are the only two scientists in the Congress.

Mr. SCHIFF. If the gentleman would yield.

Lawyers are taking such a beating on the House floor right now, I sure wish I was one of you.

[Laughter.]

Mr. BARTLETT. I'm tempted to say, it couldn't happen to a better group.

[Laughter.]

Mr. BARTLETT. We now, as you know, are in a frenzy of downsizing. My concern is that in a desire to do something relative to the National Laboratories, we may end up doing the wrong thing.

I think that what you all do is so difficult for the big majority of the country, including the Congress, to understand, that it's very difficult to make sure that we're going to make decisions that represent really good judgment and that are based on fact.

I'd like to suggest a way of reaching this decision that's kind of patterned after the Base Closing Commission. That, as you know, was a frightfully difficult political process to close military bases, and we weren't able to do that. I'm not suggesting any labs need to be closed, but I think that there is a need to look at where we are, how we got here, and where we go from here. And we depoliticized that whole process with the Base Closing Commission. I'm now involved in that. There's a base in our district that's on the list, so I'm becoming more and more familiar with that process.

But that has worked very well—it has depoliticized it, and I have a bill which would set up a Commission that looks at the laboratories, all of the laboratories, across the board—that would make recommendations as to what ought to be done. Whether they should be privatized, combined, closed, or corporatized, what would be the best framework for the future? How they should be managed—what would be the role of DOE? I think there's at least a 25 percent probability that DOE will not be here a year from now as an entity. This may, as a matter of fact, be welcomed by the laboratories because they would then have not just a single entity that was focused on them, and you would not get—

Mr. SCHIFF. Will the gentleman yield for one second before we go to the panel?

With respect to the gentleman's question about a commission to look at the National Laboratories, does the gentleman mean an advisory commission, or does the gentleman mean a commission like BRAC?

Mr. BARTLETT. Like the BRAC Commission that would make a recommendation that needs to be voted up or down by the Congress. Once it got to the Congress through a very deliberative process like the BRAC Base Closing Commission, we'd either vote it up or down.

My concern is that there's going to be so much politics involved in a final resolution, if we're going to do any meaningful downsizing, that we may do less than the right thing.

I was wondering what your reaction would be to a commission that would look broadly and definitively, over perhaps a year's period, at the laboratories as to how we got here and where we're going, to make those kind of recommendations so that Congress could vote up or down, but not change. We'd depoliticize it.

Mr. SCHIFF. Dr. Shank?

Dr. SHANK. I think a base closing commission, or a lab closing commission, is based on the premise that laboratories should be closed.

Mr. BARTLETT. If I may interrupt sir, please remove that word, if you wish. To look at the labs and decide what ought to be done in the best interests of the country.

Dr. SHANK. I'd like to point out that none of our laboratories receive an authorization. We have a budget to do work, and if the budget is not there, we will naturally not be responding to national need, and there'll be an action to that response.

We don't have an authorization that goes directly to a lab. They go to scientific programs. As a consequence of that, whether you need more labs or fewer labs really depends on executing the program, executing the national need. A closing of the lab doesn't per se save money.

Mr. SCHIFF. Dr. Trivelpiece?

Dr. TRIVELPIECE. I more or less want to say a somewhat similar thing to what Dr. Shank said.

A base closing commission is a means of getting at a problem which is[1] a military base, one or another looks pretty much the same. They produce captains, colonels, lieutenants, privates trained to go into combat and so on. You can take[2] it, put it out of existence, etcetera, and you will get more or less the same result each time.

A National Laboratory comes into existence over a period of ten, 20, or 30 years, and develops a certain set of skills. So taking it out of existence and saying, well, if we need one next year, we'll just recreate[3] one. There isn't a parallel between it and a military base.

We get funded based on programs. The Congress appropriates money for programs. If you stop a program, we will stop doing work. In our own case at Oak Ridge, the new production reactor was reduced and $16 million left the laboratory and I had to accommodate to either firing people or finding something else for them to do. If you were to stop other large programs, you would find that the laboratories would be reduced.

Focus on the programs. We don't have a means, by which, if you say reduce the laboratory by ten percent, I don't know how to send the appropriated funds back to the Treasury. There's been an authorization, an appropriation and apportionment of money by OMB and a distribution by the Department through program letters. We're now under obligation to perform.[4]

So if you want to look at a thing to do, look at what programs ought to be funded in the United States, and not sort of focus on whether it should be university, industry, or National Labs that do them, but let the best performer do the work. And in that case, I believe we would be among the best performers.

Mr. BARTLETT. That, sir, is the focus and I'm sorry that this word "close" is in there.

Mr. SCHIFF. I hate to interrupt. I have to say the gentleman's time has expired, but I interrupted the gentleman earlier. I give the gentleman another three minutes to make up for the time I took.

Mr. BARTLETT. Thank you very much.

I have a specific question to ask of Dr. Gay. I am very concerned about our energy future and what I think has been, over the past several years, a too small focus on alternative energy sources.

If you look at the absolutely enormous amounts of energy that we now derive from fossil fuels and recognize that the high quality, readily available fossil fuels are not going to be with us forever, we obviously need to turn to some alternative fuels.

Do you share my concern that we need a more vigorous focus to look at alternative energy sources if we're going to have an energy future where we have energy available as readily and as cheaply as we now have it available?

Dr. GAY. Certainly I share your basic spirit here, having worked in renewables for my entire career, and what I'm anticipating being able to do at NREL is to carry that on, and link what the laboratory system does more strongly with industry and its growth.

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[1] Witness is inserting after is "that of eliminating".

[2] Witness wants "take" deleted and insert "create".

[3] Witness is inserting after recreate "a new".

[4] Witness is inserting after perform "the work".

And what we need, in order to make things happen in the future, is to have a strong and healthy industry to go forward with the technologies that are being developed in the labs.

So I think we can do our job more efficiently and more effectively, but I think at the core of this, we share the same spirit, Mr. Bartlett.

Mr. BARTLETT. Thank you.

Just in closing, Mr. Chairman, we need to know what we can do as government. Do you need some relaxation of antitrust laws so that across the industry you can get together to combine your resources and so forth?

I knew that you came from a photovoltaics background. I am personally a user of photovoltaics and am very enthusiastic about the potential of alternative energy systems and the contribution they make not only to our economy but also to our environment.

Dr. GAY. I'm delighted you're a happy customer of our former products.

At this point, I don't see any need to change the antitrust issues or other themes along those lines. I think there are some innovative ways of moving technology out of the laboratory more rapidly than we have in the past, along with some style approaches that are common within industry in bringing venture financing and other sorts of financing to help that happen. But I have not seen a situation where there needed to be a change to the antitrust laws.

Mr. SCHIFF. The gentleman's time has expired. If I may say, we may have some time for some follow up questions here. Ms. Jackson Lee is recognized for five minutes.

Ms. JACKSON LEE. Thank you, Mr. Chairman. And thank you, gentlemen, for your appearance here today and this afternoon. Let me ask that any member that chooses to answer the question please do so.

I ask it initially for any members who would take issue with the Galvin Report generally as it relates to your particular labs and the responsibility of some of the civilian work, just a general response to that.

But then I'd like a specific response to the question of technology transfer activities of the laboratories.

It seems the Galvin Report suggests that technology transfer should not be an integral part of laboratory activities by excluding it from your mission but, yet, applauds the work that has been done.

So my question is, where are we? What is of value that took place in technology transfer and how that relates to your labs' business.

Then, as a more or less unrelated but yet related question, how do our universities, if you will, play into this very needed and active part of the nation's business, which is getting technology out into the marketplace.

For example, the work that's being done on superconductivity in a university research lab.

I would appreciate a response, and I will debate you or interact with you.

Mr. SCHIFF. Why don't you go ahead and recognize the person?

Ms. JACKSON LEE. I will do this in the fairest manner and start with Dr. Trivelpiece, then Dr. Shank, then Dr. Samios.

Thank you.

Dr. TRIVELPIECE. With the discovery of high temperature superconductivity, there was concern by the science apparatus of the United States that perhaps the United States wouldn't benefit from that. There is an activity or rule that goes back to the Economy Act of '32, which makes it difficult, if not impossible, for a private sector entity and a National Laboratory to have money put on the barrel head, simultaneously work on a project together, and take away proprietary results.

Superconducting pilot centers were established at three of the laboratories, which made that possible. The origin of the CRADA is basically taking that principle and extending it to the rest of the United States.

The Act of 1989, the Technology Transfer Act of '89, that Act created the CRADAs. The CRADAs make it possible for a private sector entity and a government entity to work together and have proprietary results taken away by the private sector entity.

That's only one tool but it has proven to be an incredibly effective tool by which Federal funds can be extended by having private sector funds simultaneously merged with it in a way that is legally allowed. That is only one tool.

I think what Mr. Galvin said was that this is to be encouraged and it has worked well, and that it isn't that technology transfer isn't an important aspect of what we do; it is that it shouldn't be a compelling mission but rather an ancillary activity, but nevertheless an important one.

Ms. JACKSON LEE. Dr. Shank, and would you, as well, include any other issue that you might be concerned with in the Galvin Report, if that comes to mind, and then also this issue of technology transfer and the partnerships.

I would raise the point of is it important in some instances for the government to have some kind of format, as a lightening rod or a spark, to encourage that technology to be promulgated, if you will, or to be further researched? Then, of course, it is a partnership out to a commercial entity or to a university partner?

Dr. SHANK. I would certainly like to respond to your question concerning this issue of technology transfer. I think one has to read very carefully what the Galvin Report said.

I agree with the conclusions of the Galvin Report that technology transfer is a derivative mission. It arises out of the work that we normally do. We use that work to leverage or to get value from the investment made by the Federal Government in our work. We make sure that our businesses capture that activity. I believe that's a very appropriate way to describe what we do.

I think what Galvin cautioned us is do not go out and create a mini-Department of Commerce and produce technology transfer as an end in itself. All the investments that are made in our laboratories are investments for our mission, and our technology transfer should be a piece of that.

I'd like to give you an example that, in some sense, ties together some of your concerns. It happens to be the one on superconductivity. We at Lawrence Berkeley Laboratory pursued thin film superconductivity, and partnered with the University of California at Berkeley to do the fundamental understanding of the process, to improve those materials. That led to building the first superconducting circuit, which has ultimately been transferred to a company which is now a business called Conductus. This activity had both a National Laboratory with activities funded by the Department of Energy, expanded upon with a partnership with a company to create a new entity, which is now creating jobs as both a Federal Government, a university, and a private industry piece, all of which reinforced and improved our program and understanding of superconducting materials. And so I think that that fits well with the Galvin definition and well within the concern. And I think the kinds of things that Galvin was talking about when he thought about alternative futures, should we become stand alone entities that solve problems for industry in a job shop manner and in that case, he said no. And I think he very clearly supported that statement and reiterated that today when he was here in his testimony.

Mr. SCHIFF. The lady's time has expired, but Dr. Samios, were you going to respond on this? Please go ahead.

Dr. SAMIOS. I'll try to be brief.

Ms. JACKSON LEE. Thank you very much, Mr. Chairman, I appreciate it.

Dr. SAMIOS. I'll take another tack.

Another way that the labs, all our labs, work well with industry is with our large user facilities, not only with industry, but academia. I should comment we build, design, and operate very large facilities and the government funds them, and we have many of them at many of our labs, with major participation by academia and industry. Major, by that I mean in many of the facilities, the industrial participation can be up to 20 percent, 25 percent, which industry supplies money for the equipment on the floor and the sums of money can be in the $50 million dollars. In return, they do the science and they publish in the open literature, and they solve problems that have relevance to industry.

I think that's one of the major transfer methods that the labs and industry have worked very well in the past and will continue to do so. And, of course, we do that with academia as a matter of course since our inception.

Ms. JACKSON LEE. You think that's good?

Dr. SAMIOS. I think it's excellent and I think Galvin reinforced that, and it's a very natural, natural thing for us to do across the board.

Ms. JACKSON LEE. Thank you, Mr. Chairman. Thank you.

Mr. SCHIFF. All right. Ms. Jackson Lee, I think we'll have a couple of minutes for another round of questions, if you like.

Congressman Ehlers?

Mr. EHLERS. Thank you, Mr. Chairman.

I've several comments, and I might say I have a unique perspective since I've worked at three of the National Laboratories, was offered a job by a fourth, and I visited two others.

[Laughter.]

Mr. EHLERS. I won't tell you which one. That was a long time ago in the sixties, but I've also spent a year at the Joint Institute for Laboratory Astrophysics at Boulder, which is an NBS facility at that time, and I served on a panel at NBS.

And perhaps my perspective is pretty much from that experience and serving as what is commonly called a bench scientist working at government laboratories. I observed during that time, and that was some time ago, an increasing dilution of resources away from the scientific enterprise and into the administrative enterprise. I suspect that trend has probably gotten even worse after I left the laboratories. And if there's anything that Galvin Report has done which I think is worthwhile is point that out in a very accurate and well-founded way.

I'm somewhat haunted by Dr. Samios' statement a while ago that he's been around a while, although probably not as long as I have, but has seen panels come and go, and the net result of each one is that things get worse.

I will certainly do everything I can to ensure that that doesn't happen here, because I think the Galvin Report has given us a real springboard to improve things. My question is, how can we ensure that we do, in fact, improve things?

And I personally think they're right in saying that Congress is a good share of the problem. I'm convinced that the Department is a good share of the problem, and yet I'm still a little skeptical about the corporatization concept. Maybe I simply don't understand it well enough, but in my experience, I had found corporations are fully as capable of becoming too bureaucratic, to administrative-oriented. And I come from a state that has automobile companies, and we've seen them go through that traumatic experience in the last two decades.

So I don't think a particular concept is necessarily the answer. I think what's important is the approach that's taken. I would almost feel better if the report had talked about Congress defining its own mission and establishing a mission for the Department, rather than just talking about the mission of the laboratories, because I think we're the ones, and the Department in Washington have been the ones, that have not defined their mission carefully and often have exceeded what one might consider the appropriate mission.

So I'm rambling a bit, but I'd appreciate any wisdom you could shed on this in terms of how can we ensure that this report is acted on in a reasonable way, and that we really get at the guts of the problem, that we don't just reorganize for the sake of reorganizing, which too often happens in this sphere, and get the resources where they matter, in the hands of the people who are doing the research and doing the work. I can see Dr. Samios is inclined to answer and we'll start with that.

Dr. SAMIOS. Let me make it a little worse. I think the difficulty is oscillating national goals. I've been around for a while, everyone says. Two years ago, for instance, people said, don't do applied physics,[5] don't do basic research, but applied physics. Then two years later say, no, no, applied physics is bad; you should do basic research. And after awhile they say, we're not interested in research, we want a better mousetrap. So we have an oscillating policy that changes year by year. As a result, it's very difficult to manage a national lab or any enterprise, if your policy keeps changing.

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[5] Witness wants "don't do applied physics" deleted.

I don't know how to answer that, but we need a long range policy by the government on science and what the agency or the institution should do.

So that's what I hope comes of this, something long range that we don't change: every new Administration comes in has to reinvent the wheel; that every new Congress comes in; new Chairmen; and there's a whole new process of education.

We need stability and continuity, and how one achieves that I don't know. It used to occur when there was one Committee, for instance, in the Congress, the Joint Committee on Atomic Energy which provided that continuity. Now the Congress has I don't know how many Committees reviewing the poor Department of Energy, each with their own Chairmen and their agenda. That, of course, causes difficulties.

I haven't answered your question, but you can see the inherent problem. I appeal for long-term stability or at least a program that has a few years, four or five years' continuity, before it gets rapidly changed.

We've wasted a lot of money. Carter built demonstration plants, the next Administration tore them down before they were finished. So we're squandering money because we don't have a policy that's set for long term.

Mr. EHLERS. I very much appreciate that perspective and frankly I've been very concerned about the actions of the Senate in the past few years and the emphasis on strategic research at the NSF. It doesn't directly affect you but I think it has really created difficulties for them and has resulted in a misuse, I wouldn't say misuse, but certainly poorly-directed funding.

Mr. SCHIFF. The gentleman's time has expired, but I think Dr. Denson wanted to respond, so please proceed.

Dr. DENSON. In the near term, and I agree with what Nick says, but in the near term, one of the things that the Congress could look at closely is this stovepipe funding we have to deal with, where the funding is in such micro arrangements that it's very difficult to integrate the work and make sure all the work is done. So in the near term, I think the Congress could look at that, and probably would give us a lot of help.

Mr. EHLERS. Thank you.

Mr. SCHIFF. If the panel can give us another few minutes, I'd like to see if any members would like to ask some additional questions. Let me begin with Mr. Bartlett.

Mr. BARTLETT. Thank you very much. You were talking about national goals and the role of the labs in implementing these national goals. Just a word about my background.

I spent a lot of time in basic research and then went over into the engineering world and ended up with 20 patents, so I understand something about basic research and engineering.

I also want to mention that I am just enormously supportive of the philosophy of Abraham Lincoln that government should only do for its citizens what they cannot do for themselves.

And there's much at the cutting edge in science and technology that we cannot do for ourselves and that government needs to do. So for that reason, I voted for the space station.

We don't have very many opportunities to vote for specific programs, but I voted for the space station, I voted for the superconducting super collider.

What percent of your mission would you say was basic research, and what percent is engineering R&D?

Mr. SCHIFF. Dr. Samios?

Dr. SAMIOS. That varies radically from laboratory to laboratory.

Mr. BARTLETT. Yes, sir. I understand that.

Dr. SAMIOS. Each Lab Director will give you a different number.

Mr. BARTLETT. Is it fifty-fifty roughly across the board or more basic, more R&D?

Dr. SAMIOS. In our lab, it's probably 75 to 80 percent pure research.

Mr. BARTLETT. Basic research?

Dr. SAMIOS. Basic research, but other labs could be different.

Dr. DENSON. At the INEL, it's about sixty-forty.

Mr. BARTLETT. Around sixty-forty, so basic probably predominates across the labs, basic research? That really speaks to the concept that the Galvin Study had, and that was that the government ought to be a customer, the Department, and that the laboratories should manage their own affairs. I was really appalled when I came here and heard my colleagues talking about directed basic research. Of course there is no such thing. That is a contradiction in terms. If it's directed, it's not basic. But, I think that so few people they want...they want a societal payoff—I doubt that Madame Curie had any notion that what she was working with in radiation would ever have any societal payoff. It's really, you know, having come from the basic research area with a hundred papers, I understand that you pursue knowledge and you don't know where it leads. But you can be very sure of one thing. That if enough people are pursuing the cutting edge of knowledge, that there will be societal payoff. You don't know where it will occur, or when it will occur. And so I just have a real concern about micro-management and where we're going. Your comments?

Mr. SCHIFF. I will have to add the word briefly to the request for your comments at this point.

Dr. SCHRIESHEIM. Yes. I would only comment in the following sense, that I find it useful in thinking of basic and applied, to think of two other words or two other terms. And that is a long- and short-term time horizon.

Because the applied research work, in areas that have that, need a lot of understanding in order to get to where you want to go in an applied sense, have a long-term horizon. And that long-term horizon then means that you have some difficulty in disentangling what is basic research from applied research, because in order to fulfill the objectives of a very difficult long-term applied problem, one has to obtain a reasonable amount of underpinning architecture.

So the labs which are attempting to fulfill societal obligations, in the sense that there are these very difficult societal problems that require science and technology for solution, get involved in these long time horizon issues which, at the end you say, well that's applied. But, what it has required is this strong underpinning that we bring to bear on those problems. And that's why I like to think of it in terms of time horizons. So I appreciate the indulgence of the Chair in order to let me make that statement.

Mr. BARTLETT. Thank you.

Mr. SCHIFF. We're about to run out of time here, but Dr. Samios and Dr. Madia, if you'd like to briefly?

Dr. Madia?

Dr. MADIA. I'd like to add one point to our comments there.

As Lab Directors, we also have the opportunity to choose which areas of basic science we engage. And at our laboratory, Pacific Northwest Laboratories, where our primary mission is environmentally focused, we choose areas of basic research that are supportive of, in the long run, that primary mission.

So our focus on life science, biological sciences, health effects, and fundamental process chemistry, which we think in the long term will lead to applied or applications programs, meet that primary mission.

So I think there is a bit of focusing even in the basic research agenda that is necessary to meet longer term mission-oriented goals of our particular laboratories.

Mr. SCHIFF. The gentleman's time has expired.

Ms. Jackson Lee?

Ms. JACKSON LEE. Thank you very much, Mr. Chairman.

Let me first of all say that I tend to agree with my colleague from Michigan about being suspect about general corporatization of the labs. I think the labs are basically good.

And then if I may add, if I give you a sense of my background—I'm a consumer, but also as a lawyer, tended to work with some biotechnology groups in the City of Houston as they began to look at formulating small companies and began, I guess, in the late eighties or so, in our community, as to how they would posture themselves.

I think that it is important that we have a mission in Congress and that we have some direction as to where we would like to go in terms of this whole science thing, and likewise, as we design that or refine it, that then impacts on the direction of our National Labs.

I would simply ask the question, being a supporter, that there are valuable aspects of having a large entity that allows for research and access to such equipment; but what I would raise with the labs, as to whether or not there are some smaller programs or smaller research going on in basic research, for example, that might be more well-suited for a university setting?

And I think I kind of raised this before, sort of an internal downsizing or, if you will, shepherding out some of the smaller aspects of the research, and redefining the labs for major projects. And, of course that's a determination for scientists that would make the labs themselves certainly more efficient and more focused.

Yes, Doctor?

Dr. TRIVELPIECE. The term "small basic research" I think carries with it some unfortunate baggage. A great deal of the "small research", that's done at laboratory does use large facilities.

For instance, we have a reactor. Hundreds of scientists from universities throughout the United States come, bring their samples, do their studies, go away back to their academic institution and write their papers. They do this small science. The question is could they do that small science at their academic institution without being able to come to Oak Ridge and use the reactor? The answer is no.

Now, extend that to 100 facilities distributed throughout all the ten laboratories, and what you find is that a great deal of the so-called small science done by universities is, in fact, done at all the National Laboratories.

Ms. JACKSON LEE. Dr. Samios, then Dr. Shank.

Dr. SAMIOS. Let me paraphrase a bit of what Al said. There's a tendency to do our work with our large facilities. It's to our advantage at the labs. We build the large facilities and so most of our research is connected with them.

Again, let me emphasize that our usage of these facilities is usually at the 10 to 20 percent level, so the 80 to 90 percent is done by outside people, university and industrial types.

I would also argue that in certain instances, the labs have a competitive edge, even in the so-called small science, because of a multi-disciplinary nature, and our ability to cross departmental lines and create new departments.

I agree with you though that we should not be in the business if we're not competitive, if not better or as good as anyone else. For instance, in the biology area, many of our labs are into genome sequencing because we have ideas. It's in the stage now where you would need a clever idea to bring the cost of sequencing a base pair from a dollar a base pair, to a penny a base pair. We don't know how to do that.

So what you want to do is look at a thousand flowers bloom until you get the idea, before you spend a lot of money into the expensive sequencing; that should be done where people have the brains and the enthusiasm to do it. And the National Labs are very competitive.

Again, it's somewhat small science, in a big science domain. The principle again I reiterate, because one of our basic missions is the large facility game which we get involved in, but there's some caveats.

Ms. JACKSON LEE. Dr. Shank?

Dr. SHANK. I'd just like to say, very briefly, that National Laboratories are at their best in problem-focused research. We draw upon disciplines to solve problems.

Universities are really at their best in discipline-focused research and creating a scholarship in a given area. Many problems require lots of disciplines to be able to go forward.

I think that there's plenty of room for partnership between universities and laboratories to solve problems. At the Lawrence Berkeley Laboratory, we have an extensive involvement of university researchers in working on our problems. In many cases, they are working on problems that couldn't be worked at as easily in a university context because they require so many interfaces in so many different fields that they interact with.

And so I think one has to be very careful to put the dichotomy based on size. Although complexity is something that we do very well in National Laboratories, we also work on problems that actually have solutions that require many different pieces to solve a problem.

Ms. JACKSON LEE. Thank you.

Thank you, Mr. Chairman.

Mr. SCHIFF. The lady's time has expired.

Mr. Ehlers, do you seek recognition?

Mr. EHLERS. Yes, thank you, Mr. Chairman.

Mr. SCHIFF. The gentleman is recognized for five minutes.

Mr. EHLERS. I can be very brief.

I asked a question last time around, and time ran out, and I noticed Dr. Trivelpiece and I believe either Dr. Shank or Dr. Schriesheim wanted to respond to it as well. Do you recall the question? Basically I was asking how can we ensure that the Galvin Report, when implemented, does in fact lead to improvement? What should be the major objectives?

Dr. TRIVELPIECE. One of the things that has been, I think, overlooked a little this morning is the—that, well—we need to reduce the size. There needs to be efficiency improvements. Therefore there are too many contractors. Reduce the number of contractors doing work, and that will improve the efficiency.

I think that the whole balance between the staff of Federal employees at the Department of Energy, as well as the staff scientists at the laboratories, needs to be examined in a way to determine where the oversight and auditing functions have resulted in inefficiencies at our end.

Yes, we have hired a lot more people; in some cases, recently. We have many people who are bench scientists, who are doing work that is in response to oversight and audit, that ought to be doing bench science.

So if you got that into proper balance, our efficiency would automatically increase. But, to just simply say, "We're inefficient, therefore, get rid of contractors",—I don't believe is the right answer.

So, when you look at the question the way you asked it, it needs to be looked at in balance across the entire complex, to make sure that the reductions, modifications and improvement in efficiencies take place in a way that actually results in that effect occurring.

Dr. SHANK. I'd like to say briefly that in my vision of laboratories, to begin to operate like a well-run industrial laboratory, everybody that's there ought to contribute some very important value-added function.

I think we've allowed non-valuated functions to creep in the governance of the labs and forced us to create those within our laboratories.

I believe that we're going back and reexamining what every Federal employee does in the Department of Energy could be a very important part of assessing and building up the minimum necessary capability that we need to do cost effective oversight.

Mr. SCHIFF. I have to ask if we can be very brief at this point because there is a vote on. Dr. Schriesheim? And then Dr. Madia.

Dr. SCHRIESHEIM. I would summarize, I would make three points.

First point: it's easy to tell the labs to cut 10 percent, cut 20 percent. The labs will respond because we're very well-managed internally. I can guarantee you that. But that is something which I admit to being prejudiced, but I think that's not in the best interests of this country.

The second point I would make has to do with the two major points of the Galvin Commission. They are very specific in terms of what if it were done would actually be something which, at the end of a year, we could say we had accomplished something. First there is Appendix B. There isn't any reason at all why Congress cannot hold the Department and the labs' feet to the fire in terms of fulfilling that Appendix B where appropriate. And then there is the issue of corporatization, which is the other major recommendation of the Committee.

Now, whether or not one agrees with it or disagrees with it, it has to be examined, and either acted on or laid to rest.

So I think you've got very specific recommendations, that if I had them as a lab director, with respect to my lab, I know what I would look for at the end of a year. And I think you should look for that at the end of a year.

Mr. SCHIFF. Dr. Madia, if you wish, very briefly, please.

Dr. MADIA. Very briefly, sir.

I've managed laboratories in both contexts—a National Laboratory and private laboratories. Similar focus on technologies, multiple customers, multiple programs.

It's undoubtedly—there is less productivity in the National Laboratory because of this excessive bureaucracy that we deal with, than any other situation I have seen.

And to directly answer your question, a primary driver in that lower scientific productivity, is this internal oversight.

I've managed under NRC, EPA, and OSHA. They do a fine job in keeping the laboratories safe, and as a particular action, that's one that stands out in Appendix B that I think is a very important action this body can deal with.

Mr. SCHIFF. The gentleman's time has expired.

Timing is everything and we have a vote right now. I want to thank this panel for your contribution to this hearing today, and the Subcommittee is adjourned.

[Whereupon, at 1:05 p.m., Thursday, March 9, 1995, the Committee was adjourned sine die.]

APPENDIX I

104th CONGRESS
COMMITTEE ON SCIENCE

ATTENDANCE RECORD

JOINT HEARING
SUBCOMMITTEE ON BASIC RESEARCH
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
GALVIN REPORT / DOE LAB HEARING
March 9, 1995

Rm.	Phone	Name	Present	Absent
2404	56316	Mr. Schiff, NM	X	
2448	55071	Mr. Geren, TX	X	
2338	52415	Mr. Rohrabacher, CA	X	
2432	52031	Mr. Hayes, LA		
2369	52411	Mr. Walker, PA	X	
2300	56161	Mr. Brown, CA	X	
2246	53665	Mr. Boehlert, NY		
236	54801	Mr. Cramer, AL		
2159	53515	Mr. Fawell, IL	X	
1410	58171	Mr. Barcia, MI		
106	55341	Mrs. Morella, MD	X	
217	56411	Mr. McHale, PA	X	
2452	52011	Mr. Weldon, PA		
325	58220	Mr. Roemer, IN	X	
2264	52002	Mr. Barton, TX	X	
1123	58885	Ms. Johnson, TX	X	
1724	51880	Mr. Baker, CA	X	
1415	52331	Mr. Minge, MN		
322	52721	Mr. Bartlett, MD	X	
1039	51313	Mr. Hastings, FL		
1717	53831	Mr. Ehlers, MI	X	

1116	56261	Ms. Rivers, MI	X	
423	53271	Mr. Wamp, TN	X	
1027	55335	Mr. Olver, MA	X	
216	53671	Mr. Weldon, FL	X	
1232	54535	Ms. McCarthy, MO		
1429	55301	Mr. Graham, SC	X	
1032	55401	Mr. Ward, KY	X	
115	52635	Mr. Salmon, AZ	X	
118	53072	Ms. Lofgren, CA	X	
415	51492	Mr. Davis, VA	X	
126	54865	Mr. Doggett, TX	X	
417	56565	Mr. Stockman, TX		
1218	52135	Mr. Doyle, PA		
425	52472	Mr. Gutknecht, MN	X	
1520	53816	Ms. Jackson Lee, TX	X	
410	52211	Mr. Largent, OK		
1419	52271	Mr. Luther, MN	X	
114	56831	Mr. Hilleary, TN		
1114	52311	Mrs. Cubin, WY		
506	55792	Mr. Foley, FL	X	
509	51976	Mrs. Myrick, NC	X	

JOINT HEARING
SUBCOMMITTEE ON BASIC RESEARCH
AND
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
UNITED STATES HOUSE OF REPRESENTATIVE
WASHINGTON, D.C. 20515

HEARING CHARTER

MARCH 9, 1995

ALTERNATIVE FUTURES
FOR THE
DEPARTMENT OF ENERGY NATIONAL LABORATORIES
"THE GALVIN REPORT"
AND
NATIONAL LABORATORIES NEED CLEARER MISSIONS AND BETTER MANAGEMENT
GAO Report to the Secretary of Energy

I. Objectives of Hearing

- To receive testimony from the Department of Energy, the Secretary of Energy's Advisory Board Task Force, and the Directors of the Department of Energy's National Laboratories on the report submitted by the Task Force on "Alternative Futures for the Department of Energy National Laboratories" (The Galvin Report) and the report submitted by the U.S. General Accounting Office to the Secretary of Energy on "National Laboratories Need Clearer Missions and Better Management"

II. Questions to be asked at the hearing will include:

- How will the Department of Energy assimilate the suggestions made in the Galvin and GAO Reports?
- With what suggestions made in the Galvin and GAO Reports does the Department of Energy agree? With what suggestions does the Department disagree?
- Will the Department of Energy make any administrative changes because of the Galvin and GAO Reports? If so, which ones?
- What long term plans does the Department of Energy have to respond to the evaluation of the laboratories made in the Galvin and GAO Reports?
- What additional statutory authority does the Secretary need to implement the Reports' recommendations?

- On the issue of governance of the National labs, what do you see as the strengths and weaknesses of the recommendation to "corporatize" the labs' management?
- What changes do the members of the Task Force see as essential to the continued successful operation of the National labs?
- How does the Department of Energy need to change its supervision and operating procedures in relation to the National labs?
- As Directors of the National labs, with what suggestions in the Galvin and GAO Reports do you agree? With what suggestions do you disagree?
- Are there changes that you can make unilaterally that will respond to some of the suggestions made by the Task Force or the GAO?
- What action should Congress take now to implement some of the suggested changes? Or should Congress take any action?

III. Background

When the Department of Energy was created in 1977, it inherited the National laboratories with a management structure that had evolved from the World War II "Manhattan Project," whose mission was to design and build the world's first atomic bombs. From this National security mission, the laboratories generated expertise that initially developed nuclear power as an energy source. The laboratories' missions broadened in 1967, when the Congress recognized their role in conducting environmental as well as public health and safety-related research and development. In 1971, the Congress again expanded the laboratories' role, permitting them to conduct nonnuclear energy research and development. During the 1980s, the Congress enacted laws to stimulate the transfer of technology from the laboratories to U.S. industry. The Department of Energy estimates that over the past 20 years, the Nation has invested more than $100 billion in the laboratories.

The 1990s have brought the most dramatic changes affecting the multiprogram laboratories, including: the end of the Cold War; reduced funding in weapons research; expectations that the labs should help improve the Nation's economic growth; and, the budget crunch. These forces have accelerated the laboratories' diversification from defense and nuclear research to environmental issues and the development of commercial technologies.

The purpose of this hearing, and for possible future hearings and legislation, is to identify and examine the principal issues affecting the laboratories' missions and the Department of Energy's approach to laboratory management. This will help the Committee respond effectively to the question, "What should be the future of our National laboratories?"

Testimony before the Subcommittee on Basic Research
Subcommittee on Energy and Environment
United States House of Representatives
Washington, D.C. 20515

Alternative Futures for the Department of Energy National Laboratories "The Galvin Report" and National Laboratories Need Clearer Missions and Better Management

Dr. John Peoples, Director
Fermi National Accelerator Laboratory
March 9, 1995

Introduction

Mr. Chairman, I am John Peoples, director of Fermi National Accelerator Laboratory in Batavia, Illinois. I am pleased to be asked to comment on the report prepared by the Task Force on Alternative Futures for the Department of Energy National Laboratories, the Galvin Report. I regret that I cannot be present in person, but I am grateful for the opportunity to submit these remarks for the record at the request of the Committee staff.

Laboratory Missions

When the Galvin Report concluded that there was a need for better, clearer missions for the national laboratories, the task force had not examined the missions of dedicated program laboratories like Fermilab. Because they did not, I want to begin by presenting Fermilab's mission. Fermilab's entire mission statement is just two sentences long:

> Fermi National Accelerator Laboratory advances the understanding of the fundamental nature of matter and energy by providing leadership and resources for qualified researchers to conduct basic research at the frontiers of high-energy physics and related disciplines. Fermilab fosters and stimulates science education, transfers to industry technologies developed at the laboratory, and conducts operations with the goal of excellence in health, safety and the protection of the environment.

The first sentence could scarcely be clearer. The second sentence recognizes the potential secondary benefits that come from research in fundamental science and the need to respect the safety and health of all who are touched by the Laboratory. Fermilab's mission fits squarely within the fundamental science mission of the Department of Energy.

Fermilab is a Department of Energy laboratory dedicated to research in elementary particle physics, or high-energy physics. In its introduction, the Galvin Report identifies energy as the essence of what the Department, and particularly its laboratories, should stand for, and observes that "Virtually everything the laboratories do 'is' energy." Virtually everything Fermilab does is dedicated to the observation of the energy that is released when two very high-energy subatomic particles collide. Fermilab fulfills its mission by creating many trillions of these collisions every year, and by providing the detectors and other resources for experimenters to record what happens in the flashes of energy released in these collisions. That is the principal way that the science of elementary particle physics advances. The recent discovery of the top quark by scientists at Fermilab is a striking example of the way such advances occur.

The task force noted that "expanding the base of scientific information—one of the nation's greatest long-term strategic assets—through pioneering work in a number of areas of fundamental science mostly related to the energy agenda" contributes to the security interests of the nation. Fermilab is engaged in expanding the base of scientific information. It was the linkage between the fundamental science of nuclear collisions and the development of nuclear weapons that led the Atomic Energy Commission to build and operate large facilities like Fermilab for research in high-energy physics. That mission has evolved over the years to the point where the Department of Energy is steward of nearly all nuclear reactors and particle accelerators that are required for fundamental research. The Department provides the funding for organizations such as Universities Research Association, Inc., the consortium of universities that operates Fermilab, to build and operate the particle accelerators and detectors for the benefit of university scientists from across the country, enabling them to carry out pioneering research at the frontiers of particle physics.

The Department also funds many of the individual investigators from the universities, enabling them to participate in the construction and use of the particle detectors at the laboratories. The Department of Energy funds 95 percent of U.S. research in high-energy physics. It funds the operation of the only high-energy accelerators in the U.S. that work at the energy frontier. It was the strong partnership of government, the national laboratories, and the research universities, sustained for half a century, that gave the U.S. world leadership in this field—leadership our country would not have achieved without this federal partnership, and that we are in the process of losing as the Europeans prepare to take over the energy frontier in another decade.

"Division of Labor"

In commenting on the missions of the national laboratories, the Galvin Report states its finding that the national laboratories have a role in conducting "long-term, often high-risk R&D, frequently through the utilization of capital-intensive facilities which are beyond the financial reach of industry and academia, and generally through the application of multidisciplinary teams of scientists and engineers. *We believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist.*" (Emphasis added.)

I want to point out that Fermilab is one laboratory where the division of labor is clear, appropriate, and effective in achieving the Department's mission. Fermilab is operated primarily for the benefit of the U.S. university community. In the simplest terms, the Department of Energy provides the funding and the program direction, the Fermilab staff provides the particle collisions and the management structures to build the detectors that are used to observe and record the collisions, and university scientists contribute to the construction of the detectors and, in turn, observe and analyze the collisions to advance scientific understanding. Two Fermilab collaborations recently made news for their discovery of the top quark using collider detectors to observe several trillion particle collisions. It is instructive to look at the list of collaborators who were authors of the two scientific papers reporting the top quark's discovery. Of the 875 authors, 514 came from U.S. universities, 246 from foreign universities, and 115 from Fermilab. These two experiments exemplify the great potential of the partnership between government and the universities to achieve scientific advances.

As I noted earlier, Fermilab is managed for the Department of Energy under contract by Universities Research Association, Inc., a consortium of 80 research universities. URA's Board of Overseers continuously monitors and adjusts the balance between university users and Fermilab staff at the Laboratory.

The Government-Owned, Contractor Operated, or GOCO, management system in place at the national laboratories reserves to the Department of Energy certain "inherently governmental functions" as custodian and steward. As then Budget Director David Bell told Congress in 1962, there are certain functions that may not be contracted out. They include:

> the decisions on what work is to be done, what objectives are to be set for the work, what time period and what costs are to be associated with the work...whether the work has gone as it was supposed to go, and if it has not, what went wrong, and how it can be corrected on subsequent occasions.[1]

What was true in 1962 is true in 1995. Today, neither universities nor corporations, by themselves, can carry out frontier particle physics research. The scale of the research tools, the long-term commitment of resources required, and the nature of the science put high-energy physics beyond the reach of any university or corporate research effort.

Only the federal government can provide the funds to build and operate the large-scale experimental tools that university physicists require for high-energy physics. The faculty of our universities is the best source of the scientific capability for world-class research, and for the education of new Ph.D. students. Successfully building and operating the particle accelerators and detectors necessary for progress in particle physics requires significant investment over a long time. In a field where a typical experiment takes more than a decade, no single experimenter can expect many discoveries in a lifetime. When discoveries come, they belong to all of humankind; no one can make an exclusive claim to profit from their benefits. Nevertheless, the nation that makes the discoveries has the best opportunity to make timely use of them.

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[1] David Bell, Bureau of the Budget, *Systems Development and Management*, testimony at hearings before the House Committee on Government Operations, Military Operations Subcommittee, June 21, 1962, 87th Congress, 2nd Session, p. 44.

The high-energy physics laboratories also have the important function of educating successive generations of Ph.D. students in the field. After they get their degrees, most of these young scientists find careers areas outside particle physics research, contributing to the nation's economy by their work in industry and commerce. It has been said that the best mechanism yet devised for technology transfer from the national laboratories is the moving van.

Technology Transfer

The Galvin Report addresses the issue of technology transfer from the national laboratories. While Fermilab is a dedicated program laboratory whose mission is basic research, opportunities sometimes arise to share our Laboratory's science and technology. One example is the use of particle beams for medical treatment.

From the earliest days of particle physics, pioneers of the field have looked for medical applications of the particle beams produced in their accelerators. In the 1930s, E.O. Lawrence, the father of particle physics, often kept the cyclotron in Berkeley running all night in order to produce enough radioisotopes for California hospitals to use in treating cancer. In 1946, Robert Wilson, a student of Lawrence's and Fermilab's founding director, first put forward the idea of using protons for medical therapy. It was thus especially satisfying when the first proton accelerator built specifically for medicine was completed at Fermilab in 1989. It was moved and reassembled in a dedicated proton therapy facility at Loma Linda University Medical Center in California. Doctors at Loma Linda now treat more than 100 cancer patients each day, and medical facilities around the world are investigating this technology.

While proton therapy is a very satisfying example of technology transfer from Fermilab, such examples are not predictable and thus cannot form the core of our mission. We are eager to transfer useful technology when it is natural and appropriate, but our mission is to do particle physics research.

Department of Energy Orders

One major thrust of the Galvin Report that is applicable to Fermilab is the maze of conflicting orders and regulations that my colleagues and I must negotiate every day. Because of Fermilab's well-defined and narrow mission, the Department's exceedingly prescriptive orders and regulations have not had as great an impact as at the multiprogram laboratories. Nevertheless, we have felt their effect. In the last decade the overly prescriptive management style of the Department of Energy has begun to take its toll on the effective operation of Fermilab. The multiprogram laboratories have been strangling in prescriptive orders for much longer. It is my experience that the growth in prescriptive and costly oversight has brought no measurable compensating gain in worker safety or contractor accountability at Fermilab. It is, moreover, an increase matched by the growth in Department headquarters staff.

This should not be surprising, because it is impossible for ill-informed though well-intentioned people to write prescriptive orders that will define in minute detail the process for achieving safety, for example, at both a nuclear weapons production facility and a high-energy accelerator. The process robs workers of one of the faculties that we all believe makes us human, the ability to learn from experience and to use that knowledge in new situations. When the Office of Nuclear Energy fashioned the Radcon Manual for regulating control of radiation hazards, they were proud of creating a system so prescriptive that there would be no room for error (read "judgment"). Regrettably, as a result of Radcon, Fermilab workers are at greater risk than before, because they must spend time demonstrating that nonexistent hazards do not exist, rather than concentrating on real risks that might arise in the pursuit of a science that probes the unknown.

Perhaps the uncertainty principle of quantum mechanics that describes the behavior of atoms provides a useful metaphor for this kind of prescriptive regulation. We know that if the position of a particle in space is completely described, its momentum must then be completely undefined. Taken to its limit, the set of prescriptive orders that allows no possible deviation from an intended process requires the expenditure of an infinite amount of effort. The uncertainty principle of regulation then dictates that the process being regulated is stopped forever; no discernible outcome is possible.

Making Changes in the Governance of Laboratories

Secretary O'Leary has testified to her intention and her plans to make changes in the way the Department manages the laboratories. In place of a mania for regulation, she advocates a return to common sense. Her plans to make progress in this direction include reducing the number and the nature of Department directives, replacing with a better approach the folly of "one-size-fits-all" regulation for a diverse system of laboratories, and attempting to simplify audits and appraisals.

I believe the most important change the Department of Energy can make to improve stewardship of the national laboratories is to increase—some would say introduce—coherence among its programs in the basic mission areas of defense, clean-up, energy, and fundamental science. The Department's left hand needs to know what its right hand is doing. Coherence among Department of Energy programs will do more than anything else to clarify the missions of the laboratories. The Secretary's plan to create a Lab Operating Board of Directors sounds like a sensible step in this direction.

I hope Fermilab can set an example of the improvements that are possible with the changes in governance recommended in the Galvin Report. Appendix B, "If GOCO System is Obliged," of the report provides an excellent beginning point to address the problems of excessive oversight and micromanagement. I am so enthusiastic about the potential benefits of the application of the ideas contained in Appendix B that I have begun pilot studies at Fermilab, with the expectation that the wisdom contained in this part of the report will be readily apparent in the results. I want Fermilab to be in position to adjust rapidly to the new way of doing business when the Department of Energy implements this Appendix.

Corporatization

It would be unwise to separate a laboratory like Fermilab from the Department of Energy through corporatization. Fermilab gives the Department of

Energy a means to achieve part of its mission of science and technology. A better solution than corporatization is to use the recommendations of the Galvin Report to make the Department a better steward of the Laboratories.

It is true that much of what is said in the Galvin Report has been said before. The "Packard Report" on the National Laboratories prepared for the White House in 1983, and the "President's Private Sector Survey on Cost Control," also of 1983, contained many recommendations that have a striking resemblance to those of the Galvin Task Force. Even earlier, the language of the "Bell Report" prepared by the head of then-Bureau of the Budget, David Bell, for President Kennedy in 1962, has a hauntingly familiar ring:

> "In our judgment, the most important improvements that are needed within Government are: ... To simplify management controls, eliminate unnecessary echelons of review and supervision, and give to laboratory directors more authority to command resources and make administrative decisions ..."

In my opinion, the Galvin Report substantiates the view that things have actually become worse in the last 12 years since the Packard Report. What gives me optimism now is the Secretary's effort to launch several pilot projects aimed at putting various parts of the Galvin Report into action. For example, Fermilab is one of a number of Laboratories involved in projects to change the present system of compliance with Department of Energy Environmental, Safety, and Health Orders to a system of adherence to industrial standards and direct compliance with the requirements of law. Fermilab is also part of a pilot project to determine the minimal oversight required for the Department to fulfill its Congressionally mandated oversight role in the area of business practices. These projects, and similar efforts at other laboratories, offer the prospect for significant improvements for effective laboratory operation.

We should be careful not to lay all the responsibility for excessive oversight, wasteful reporting requirements and micromanagement identified in the Galvin Report on the Department of Energy's doorstep. Most, if not all of the current outcome can be attributed to Congress. They wrote the laws, demanded greater regulation and prescription, and in so doing created the unfunded laboratory mandates. Of course, this is not just a problem for the Department of Energy; it runs far deeper, as we know.

Last, let me say how important I believe it is for the nation that we put the Galvin Report's recommendations into practice. Fifty years of investment in the national laboratories have given the people of the United States a scientific and technological resource unequaled anywhere in the world. This invaluable national resource needs to be preserved, but that can only happen if we reduce the enormous costs built into the system by counterproductive policies and practice. The Secretary of Energy seems determined to try to change her Department's policies and practices for the better; her efforts deserve the greatest possible support. We at Fermilab are determined to help, and we look forward to the challenge of renewing our Laboratory when we can throw off the shackles of excessive oversight and micromanagement.

Thank you for giving me the opportunity to provide my views on the Galvin Report.

United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Basic Energy,
Committee on Science,
House of Representatives

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DEPARTMENT OF ENERGY

Alternatives for Clearer Missions and Better Management at the National Laboratories

Statement for the Record by
Victor S. Rezendes, Director,
Energy and Science Issues,
Resources, Community, and Economic
Development Division

Mr. Chairman and Members of the Subcommittee:

We are pleased to provide this statement on the challenges facing the Department of Energy (DOE) in managing its multiprogram national laboratories. As you requested, we focused on (1) DOE's performance in managing the laboratories in light of their changing missions and (2) alternatives for managing the laboratories, including those recommended in the Galvin task force's report on the national laboratories.[1] The information included in this testimony is drawn from our management review of DOE and past work on DOE's national laboratories.[2]

In summary, Mr. Chairman, DOE has not ensured that work at the national laboratories is focused and managed to make maximum contributions to national priorities. First, DOE has not established clear missions for the laboratories that reflect a consensus among laboratory and government leaders on the laboratories' appropriate missions in the post-Cold War environment, even though past studies and special task forces have called for such action. DOE has exacerbated this problem by treating the laboratories as separate entities, rather than as a coordinated national research system with unified goals. Second, DOE's fragmented management approach has impeded the ability of the laboratories to achieve their current research missions and administrative responsibilities.

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[1] The Secretary of Energy asked Robert Galvin, Chairman of the Motorola Corporation, to chair this task force. Its report, Alternative Futures for the Department of Energy National Laboratories (Secretary of Energy Advisory Board, Task Force on Alternative Futures for the Department of Energy National Laboratories), was issued in February 1995.

[2] Department of Energy: National Laboratories Need Clearer Missions and Better Management (GAO/RCED-95-10, Jan. 27, 1995).

DOE has taken some steps to address these problems--by initiating a new strategic planning process and reforming the contracts that it enters into with the laboratories, for example. But the outcome of these initiatives is uncertain, and DOE's past efforts along these lines have not been successful. Other experts have suggested various alternatives for improving the management of the laboratories--by, for example, transferring management responsibility to other federal agencies or to universities. These alternatives would require thorough evaluation by DOE and the Congress to ensure that national priorities are met and that the laboratories are operating effectively.

One structural alternative was suggested by the Galvin task force, which was asked by the Secretary of Energy to examine options for the future of the laboratories. The task force recommended that control of the laboratories be placed in private hands. The task force's basic findings--that the laboratories' missions should be redefined and improvements made in the way the laboratories are managed--are largely consistent with the results of our work. The ultimate success of the task force's work will be judged by the extent to which it helps DOE shape a consensus on the future of the laboratories among key stakeholders: the Congress, DOE, and the laboratories themselves. Such a consensus has not resulted from past advisory boards' recommendations.

Before discussing these issues in more detail, we would like to provide some background.

BACKGROUND

DOE's nine multiprogram laboratories have over 50,000 employees and combined annual budgets of about $6.5 billion. DOE estimates that it has invested over $100 billion in the laboratories over the past 20 years. Most of the laboratories were established during or just after World War II as part of the Manhattan Project, which developed the world's first atomic bombs. The laboratories have since expanded their missions to encompass civilian research and development in many disciplines--from high-energy physics to advanced computing. The laboratories support DOE's programs and address national needs in science and technology. DOE owns the laboratories but contracts with universities and private-sector organizations for their management and operation.

THE LABORATORIES' MISSIONS ARE NOT CLEAR

The dramatic reduction in the nuclear arms race brought about by the collapse of the Soviet Union raises questions about the future role of the three large defense laboratories--Lawrence Livermore, Los Alamos, and Sandia--created to design, develop, and test nuclear weapons. Furthermore, all nine of the multiprogram laboratories face increasing pressure to apply their resources to current national priorities, such as improving economic competitiveness and cleaning up the environment. Redefining their missions in the face of these trends, and with limited future funding, is perhaps the greatest challenge the laboratories face.

Over the past decade, several government advisory groups have urged DOE to clarify its laboratories' missions. However, these missions are set forth as broad goals and activity statements rather than as a coordinated set of objectives with specific implementation strategies for bringing together the individual and collective strengths of each facility to meet departmental and national priorities. The Galvin task force--the latest of these initiatives--called for a more "disciplined focus" for the national laboratories. A 1992 Secretary of Energy advisory board had also reported a "loss of coherence and focus" at the laboratories and said that DOE had failed to develop a coordinated and shared vision for them.[3] We believe that the lack of proper direction for the laboratories' missions is compromising both the effectiveness of the laboratories in meeting traditional missions and their ability to achieve new national priorities.

To obtain independent views about the laboratories' missions and management, we assembled a panel of experts from industry, academia, and government.[4] These experts, as well as other specialists we consulted, have also called for more focused missions for the national laboratories. Our experts concluded that with proper focus of their missions, and better direction from management, the multiprogram laboratories can make vital contributions in many areas important to DOE and the nation. According to our panel, the highest-priority missions for the laboratories involve national defense, energy, the environment, and commercial technology. The laboratories have already made contributions in these areas--such as effective weapons systems, energy conservation programs, environmental cleanup techniques, and the development and support of technologies with commercial applications. But our panel concluded that clarifying and, in some cases, redefining the current missions for the laboratory system as a whole would enhance the laboratories' value.

DOE currently manages the laboratories program by program, not as a single research system with diverse objectives. This approach prevents the laboratories from fully capitalizing on one of their great strengths--combining multidisciplinary talents to solve complex, cross-cutting issues. For example, research on preventing the proliferation of nuclear weapons requires combining expertise in nonproliferation and weapons design--activities that are carried out by different laboratories and managed by different assistant secretaries at DOE. Similar linkages are needed among the energy conservation, fossil fuel, and nuclear energy research areas.

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[3] Secretary of Energy Advisory Board, Task Force on the Department of Energy's National Laboratories, final report, July 1992.

[4] For a list of the experts on GAO's panel, see p. 14 in Department of Energy: National Laboratories Need Clearer Missions and Better Management (GAO/RCED-95-10, Jan. 27, 1995).

We and past advisory groups have cited the need for DOE to develop a mechanism to facilitate cross-program coordination. DOE did create the Office of Laboratory Management in early 1993 to coordinate the interests of various program offices that interact with the laboratories. However, this office lacks the authority to resolve disputes among program offices and reports through two levels of command below the Secretary--an arrangement that does not promote effective interaction between DOE and the laboratories.

DOE's Management Inhibits Accomplishment of the Laboratories' Missions

DOE has struggled to manage and oversee the laboratories effectively. Many view DOE's day-to-day management as costly and unproductive in meeting the laboratories' missions. Laboratory managers have characterized DOE as a micromanager in many areas, especially in overseeing the laboratories' compliance with expanding administrative requirements.

While DOE has recognized the need to expand oversight of the laboratories, the Department's method of doing so poses a strategic dilemma for DOE and the laboratories' managers. DOE created new oversight offices, each having the authority to impose new requirements. The guidance and direction from these offices is not always consistent, and the laboratories are forced to meet similar requirements from many different offices. Moreover, DOE has not set priorities for compliance with its environmental requirements, forcing the laboratories to treat each requirement as equally important. Neither cost-benefit analysis nor risk assessment has been used to target resources for the laboratories' administrative requirements. Consequently, DOE has no assurance that the laboratories address more pressing concerns first, or with enough attention. As a result, laboratory officials are kept from managing their research most effectively, according to many experts.

A related issue is the cost-effectiveness of DOE's intensified oversight. Laboratory managers have expressed concern to us about the overall cost of a greatly increased administrative burden without corresponding benefits. Many laboratory managers feel a more balanced approach is needed, one that reflects the need for both managing a program well and ensuring compliance. Such a balance is hard to achieve under DOE's program-oriented management approach. One senior laboratory manager told us that his increased overhead costs for compliance activities makes his research more expensive than that of other competing federal and university laboratories, which are not generally subject to the same level of oversight.

Laboratory managers and experts also worry that the cost of complying with growing oversight and administrative requirements has increased their research costs to the point that they cannot compete for research opportunities sponsored by industry and other government agencies. This limitation could, in turn, diminish the ability of the laboratories to build partnerships with industry--the key to the success of their initiatives to support industry's commercial technology development.

DOE Has Taken Steps to Address These Concerns

DOE officials have several initiatives under way that they believe address our concerns. For example, DOE has launched a new strategic planning process that officials believe will provide the framework for more focused missions for the laboratories. DOE also believes that reforming its contracts, specifically by introducing performance measures to guide and evaluate the laboratories' activities, will form a basis for a more rational risk-based and productive management approach that better integrates the laboratories' missions.

We generally agree that these initiatives have the potential to help DOE refocus the missions of the laboratories and improve their management. However, these initiatives have not yet been implemented and, in the case of contract reform, will take years to be fully implemented. Thus, their outcome, while promising, is very uncertain. We also caution that in the past, DOE has introduced planning systems, reorganized many times, and tried to institute reforms--all without significant success.

ALTERNATIVES FOR MANAGING THE NATIONAL LABORATORIES

The Galvin task force gives DOE another opportunity to chart a course for the future of the laboratories. Its findings on mission and management are consistent with those reported by us and others who have studied the national laboratories. Both our report and the task force's report called for clarifying the laboratories' missions, treating the laboratories more as an integrated research system, and improving the way in which the laboratories are managed. We believe the report's many specific recommendations and observations deserve serious consideration by DOE and the Congress.

Perhaps the most far-reaching recommendation made by the task force is to "corporatize" the laboratories. Under this arrangement, one or more nonprofit corporations would be created to operate the laboratories under the direction of a board of trustees that would channel federal funding to various laboratories to meet the needs of both government and nongovernment entities. DOE would be a customer, rather than the direct manager of the laboratories. Although the task force provided few details about how such an alternative structure would be developed and implemented, and acknowledged that several variations could be studied, its proposal raises important issues that both DOE and the Congress should consider. For example:

-- The expenditure of public funds by a privately managed and operated structure raises concerns about how to monitor and oversee the use of those taxpayer funds. How would a new structure be responsive and accountable to the Congress and DOE?

-- The laboratories have significant responsibilities for addressing environmental, safety, and health problems at their facilities, some of which are governed by legal agreements between DOE, the Environmental Protection Agency, and the states. How would a new structure ensure that these responsibilities continue?

-- To what extent would this new structure safeguard federal access to facilities so that national priorities are met? Most if not all of the laboratories perform work essential to the government, including national security missions. Considerable thought would have to be given to whether and how a priority system can be developed within any alternative structure.

-- Would a new structure affect the laboratories' ability to attract and retain technically competent scientists?

In addition, organizational options that have been proposed by other experts could also be considered, including the following:

-- Convert some laboratories, particularly those working closely with the private sector, into independent entities.

-- Transfer the responsibility for one or more laboratories to another agency, whose responsibilities and mission are closely aligned with a particular laboratory.

-- Create a "lead lab" arrangement, under which one laboratory is given a leadership role in a mission or technology area and other laboratories are selected to work in that area.

-- Consolidate the responsibility for research, development, and testing of nuclear weapons within a single laboratory.

While we have not analyzed these alternatives, each has advantages and disadvantages, as does the Galvin task force's proposal, and each needs to be evaluated in light of the laboratories' capabilities for designing nuclear weapons and pursuing other missions of national and strategic importance. Furthermore, the government may still need facilities dedicated to national and defense missions, a factor that would heavily influence any decisions about future organization.

Redefining and/or clarifying the missions of the laboratories should be undertaken before deciding on the best structure for managing the laboratories. For example, the Congress and the administration should decide if research on energy efficiency is needed before deciding where and how to fund this research.

In addition, correcting the current system of management is still an option deserving of attention. Although the task force is not optimistic that DOE's current initiatives will correct problems in managing the laboratories, more specific evidence may be needed before the task of managing the laboratories is taken way from DOE.

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In conclusion, Mr. Chairman, lack of a strategic approach in managing the laboratories limits DOE's ability to ensure that the laboratories are making the greatest possible contribution to national needs. The relationship between DOE and the laboratories has deteriorated under recent changes, preventing DOE and laboratories' managers from developing a sense of common purpose. To develop a more effective management strategy, DOE needs to better define its missions and strengthen its working relationships with all of the laboratories.

We are encouraged by DOE's initiatives. These efforts--especially those concerning strategic planning and contract reform, once fully in place, should help strengthen DOE's ability to improve its own management and provide a foundation for refocusing the laboratories' missions. Our optimism is tempered, however, by the fact that DOE has reorganized before and has undertaken planning efforts in the past. Furthermore, DOE has not used the results of past advisory groups' recommendations to refocus the laboratories or improve its management of them. In any event, any initiative DOE takes to restructure the laboratory network will bear close monitoring by the Congress.

(170013)

COMMENT ON THE REPORT OF THE GALVIN TASK FORCE ON ALTERNATIVE FUTURES FOR THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES

Joint Hearing of the
Basic Research Subcommittee
and
Energy and Environment Subcommittee
of the
House Committee on Science

March 9, 1995

BURTON RICHTER, DIRECTOR
Stanford Linear Accelerator Center

Introduction

I am the Director of the Stanford Linear Accelerator Center which is one of the Department of Energy's science laboratories. We build and operate large-scale scientific facilities for use by research groups from universities, industries, and government agencies. Our facilities support research in high energy physics and in multidisciplinary studies using synchrotron radiation, where we provide ultra-intense x-ray beams from an accelerator known as a synchrotron light source. About 1600 scientists from outside the laboratory are involved in our program — a group larger than our entire staff of approximately 1400.

I regret that I cannot attend this hearing in person, but I submit these remarks for the record at the request of Committee Staff. I have been asked to comment particularly on three areas of concern in the Galvin Task Force report: laboratory missions, laboratory governance and technology transfer.

Missions

The Department of Energy has four core missions, defined in the Galvin report as national security, environment, energy, and science and technology. This science and technology mission is central to the execution of the other three missions and is carried out in a complex of laboratories that are, in effect, the brain of the Department of Energy. The laboratories are linked to the university and industrial R&D communities.

In carrying out their work, the DOE laboratories have developed broad expertise in physics, chemistry, biology, materials science, engineering, advanced computing, etc. The large-scale research instruments (user facilities) throughout the laboratory complex supply the tools for research for many thousands of scientists and engineers from outside the DOE. The Galvin Task Force says in its overview, "The laboratory's research role is a part of an essential fundamental cornerstone for continuing leadership by the United States." The Task Force reaffirms the importance of the laboratories to the fundamental long-term missions which are of great importance to the nation.

I would write the mission statement of the DOE laboratory complex as follows:

> The Department of Energy laboratory complex is tasked to attack large-scale multidisciplinary problems of national importance in the areas of energy, environment, national security and basic science. The complex also develops and operates large-scale user facilities as appropriate.
>
> The laboratories are encouraged to take advantage of mutually beneficial partnerships with industry and universities in carrying out the DOE's missions. Assistance to industry should be made available when the expertise of the laboratory complex is uniquely required, or where substantial benefits can accrue at minimal cost.
>
> The laboratories assist other government agencies in areas related to the DOE missions, or when the expertise of the laboratory complex is required to further the aims of other agencies.

This mission statement is completely consistent with the view of the Galvin Task Force. The question is often raised about redundancy, overlap and a lack of focus in the missions of the individual laboratories. This is not an issue in the so-called program-dedicated laboratories (SLAC, Fermilab, CEBAF, PPPL, NREL, etc.) where the laboratory facilities tend to be unique and the focus is quite tight. Nor is it a problem with the weapons laboratories which have a clear primary mission. The question is most often raised with respect to the so-called multiprogram laboratories which on a casual look seem to be too much alike. This is a misperception, for the multiprogram laboratories' activities and broad talent base have evolved as the Department of Energy itself has evolved. It might be beneficial to assign a leading role in different areas to different laboratories, though this is not necessary if there were an appropriate coordination of activities at DOE headquarters.

Governance

The present system of laboratory governance can be divided into two parts. The first is program oversight, which is generally effective. At my laboratory, clear program guidance is given, reviews are efficiently done using outside experts to assist the DOE's program officers, and we are held accountable for results. It even seems to me to be efficient — the High Energy Physics program office, for example, which supplies most of SLAC's funding, oversees the entire $640 million national program with a staff of 13 or 14 professionals.

I cannot say such nice things about DOE's administrative and management oversight which is micromanagement run amok. It is bloated, redundant, inefficient and costly. The Task Force report is full of examples.

The Galvin Task Force has recommended separating the laboratories from the Department of Energy and placing them under an independent National Laboratories Board. I believe that in theory this would be unwise, for it would separate the intellectual core of the Department of Energy from the Department itself. Mission-oriented agencies need their own R&D arm to further their mission. The tendency in industry over the last decade has been to move R&D closer to the operating divisions of industry rather than separating it in an isolated "think tank." The independent national laboratory commission seems to me to be too much like an isolated think tank.

When I read Section VII of the Task Force report (Governance), my impression is that the recommendation to separate the labs from the DOE is basically one of despair. The Task Force believes that a government organization must inevitably lose its ability to manage effectively because of a natural tendency of officials to want to do more whether or not it needs to be done, and the natural tendency of Congress to demand more and more oversight whether or not it is cost effective.

There is a good chance that the system can be reformed. We will be better off if it can be done, as I believe that it is far better to keep the laboratories within the Department of Energy and to repair the Government-Owned Contractor-Operated (GOCO) relationship. The Galvin Task Force outlines what has to be done in their Appendix B and I fully endorse all of those recommendations.

Secretary O'Leary has begun a process of reform within DOE that promises to accomplish much of what the Task Force says needs to be done. It will be a difficult task. In addition, in her March 1st testimony in the Senate, she announced the formation of an operating board in the Department of Energy that will be led by the Under Secretary, will include all of the Assistant Secretariat-level officials, and will include members of the Secretary of Energy's Advisory Board giving an outside perspective to the work of the operating board. These are both excellent steps that will bring much more coherence, continuity and efficiency into the operations of DOE. The support of Congress will be required if this effort is to succeed.

Technology Transfer

The Galvin Task Force's main recommendation on technology transfer was to focus on areas that contribute directly to the DOE's primary missions. This is an excellent basic policy, but it is somewhat too narrow. As I indicated in the mission statement for the laboratory complex, where the expertise of DOE laboratories is uniquely required, they should be able to work with other government agencies and with industry, even when such activities do not directly further the DOE's main mission.

CURRICULUM VITÆ

Burton Richter – Paul Pigott Professor in the Physical Sciences, Stanford University
Director, Stanford Linear Accelerator Center

Honors & Awards

Loeb Lecturer, Harvard University, 1974
DeShalit Lecturer, Weizmann Institute, 1975
E. O. Lawrence Medal (U.S. Department of Energy), 1976
Nobel Prize in Physics, 1976
National Academy of Sciences, 1977
American Academy of Arts and Sciences (Fellow), 1989

Professional Societies

American Physical Society (Fellow; Vice President, 1992; President-Elect, 1993; President, 1994)
American Association for the Advancement of Science (Fellow)
European Physical Society

Present Committees, Consultantships & Directorships

Member of the Advisory Committee — Massachusetts Institute of Technology, Lincoln Laboratory
Member of the Mitre Corporation — JASON Group
Member of the Board of Directors — Varian Corporation
Member of the Board of Directors — Litel Instruments
Member of Director's Council — Scripp's Institution of Oceanography
Honorary Member of the Board of Regents — The Mercersburg Academy

Open Publications

Over 300 publications in high energy physics, accelerators, and colliding beam systems.

March 1995

APPENDIX II

Question from Representative Sheila Jackson Lee

Question 1:	A common thread running through the written testimony of the laboratory directors is the Department of Energy should return to the GOCO model of governance, as it operated many decades ago, rather than resorting to "corporatization" or privatization of the laboratories. What do you think of this proposal?
Answer:	Much of the U.S. R&D enterprise under the aegis of the Department of Energy (DOE) is managed through government-owned, contractor-operator (GOCO) facilities, dedicated to research, development, engineering and production. This relationship was forged by the Atomic Energy Commission and its successor agencies, the Energy Research & Development Administration and DOE, in response to the dramatically successful government-university-industry partnership during World War II.

Under the GOCO concept, DOE enters into contracts with non-governmental organizations, delegating to the contractor responsibility for management and operation of a wide span of research, development, construction and operational activities. DOE retains responsibility for mission definition, program definition and oversight. The concept stems from the realization that the best qualified technical and managerial talent to execute the complex scientific and technical missions is largely concentrated within the universities and the private sector. The GOCO relationship is in essence one of partnership between the contractor and the government.

While a GOCO contract explicitly delegates the execution of all or a part of a major governmental mission to the contractor, that contractor must be fully accountable to the government for all elements of its work. Over the years, as the Galvin Task Force observed, an increasingly tightening web of legislation, government regulation, and departmental orders have evolved which has shifted the pattern from partnership and accountability to excessive bureaucratization and discouragement of innovation and management.

We agree that substantial improvement in the Department's management relationship with its laboratories is preferable to "corporatization" or privatization of the laboratories. A return to the Government-Owned-Contractor-Operated mode of governance, "as it operated decades ago," may not be possible. However, taking the steps necessary to establish an effective, performance based management system for the future would be consistent with the GOCO model and far preferable to corporatization or privatization of the laboratories.

QUESTION FROM REPRESENTATIVE LEE

Question 2. The Congressional Budget Office recently proposed dramatic reductions in the R&D activities of the Department that support technology development. What would be the hazards, if any, to the economy of prohibiting the Department from participating in technology development activities?

Answer: Were the Department's technology development activities to be dramatically cut, the U. S. economy could be detrimentally impacted both directly and indirectly. Technology development partnerships between the Department and the private sector benefit the economy directly by allowing U. S. industry and the U. S. economy to benefit from the unique technologies and skills available from the Department's programs, laboratories and facilities; the commercialization of the technologies, and payments to the Treasury for intellectually property and copyright licenses. These partnerships benefit the economy indirectly by leveraging the resources available for accomplishment of the Department's core missions, thus reducing overall cost to both the taxpayers and our partners.

Technology development is an integral component of the Department's national security, environmental management, energy supply (efficiency, renewable, fossil, and nuclear), and science and technology programs. The technology developed by these activities responds to congressionally mandated requirements, such as stockpile stewardship, and cleaning up contamination at DOE and other federal sites.

QUESTIONS FROM REPRESENTATIVE LEE

Question 3:	Several witnesses have suggested that the Department should rethink its approach to Fusion Energy Research and Development. In particular, they have suggested that the Department vigorously pursue alternatives. Do you believe that the Department could embark on a revamped program focusing on alternative fusion concepts by Fiscal Year 1996?
Answer:	It would be possible, if decisions were made to change the strategy and goals of the fusion program, to expand the level of effort in the United States on alternate concepts in a few specific areas. The alternate concepts that have shown promise are already being pursued abroad. No other concepts have surfaced that have the technical justification necessary to increase the scale of the research program.

Shifting the program focus away from tokamaks would mean greatly lengthening the time before fusion energy would produce commercial electricity while probably also increasing the overall program cost.

However, the upcoming review of the fusion program by the President's Committee of Advisors on Science and Technology, scheduled to be completed in June, will provide the Department guidance on the future direction of the fusion program.

QUESTIONS FROM CONGRESSWOMAN LEE

Weapons Laboratories

Question 4: In a post-Cold War world, do you believe that the DOE defense laboratories, when viewed as a system, could be downsized without reducing the U.S. capability to address problems associated with national defense, stockpile stewardship, and environmental management?

Answer: In February of this year, the Galvin Task Force delivered its long awaited report on the future of the DOE laboratories. We agree with the Task Force that one of the most important priorities for our stockpile stewardship mission is to attract and retain skilled scientists, engineers, and managers over the years ahead with the expertise required for the complex and demanding stewardship role. We also agree that the starting point for assessing the future size, budget levels, mission focus, and configuration of the Department's three weapons laboratories must be the national security requirements established by the President. The Department will closely evaluate the Task Force's recommendations regarding a reduction of some of the nuclear weapons functions at Lawrence Livermore and their transfer to Los Alamos. We have an initial favorable disposition for a careful phase-down of some of Livermore's nuclear weapons work, combined with a re-emphasis on non-proliferation, counter-proliferation, and verification activities. However, our actions proceeding down this path--the timing and the details--must depend on assessments of how best to meet our continuing national defense requirements in a wholly new era.

The Task Force includes a critical assessment of the Department's Environmental Management program. We do not believe that sufficient effort was made by the Task Force to develop a full understanding of the strides we have made in directly addressing problems we inherited from the past. Over the past two years, we have worked to assess and to quantify the vulnerabilities at each site and have established both a national advisory board--which includes world-class scientists--and a host of site-specific advisory boards. We have taken--and are continuing to take--bold actions to cut costs, reinvent the program, and accelerate clean-up activities. Thus we already have successfully implemented several of the Task Force's recommendations in this area, of which the Task Force apparently was unaware.

QUESTIONS FROM CONGRESSWOMAN SHEILA JACKSON LEE

Question 5: The Galvin Report called into question the existence of DOE' field offices. Is the fate of the field offices within the charge of the Strategic Realignment Task Force? When can we expect actions to be taken on the recommendations of this task force?

Answer: The Strategic Alignment task force will examine the deployment of the Department's human and organizational resources nationwide and recommend a structure and staffing blueprint that will enable the Department to serve its customers better and to do more for less. In early May, the Strategic Alignment Team will make recommendations for significant change at headquarters and in the field. This could result in the elimination or consolidation of some DOE field offices. We expect the Strategic Alignment task force to recommend actions that will result in substantial savings for the Department and improve and streamline its management practices.

Question 6: The Galvin Report recommends that the DOE laboratories be governed by independent Board of Directors and "corporatized. It is my understanding that you do not favor this approach. Can you explain your reservations about the Galvin proposal? Why shouldn't we simply privatize the laboratories?

Answer: The Department of Energy's laboratories represent a national science and technology resource. They carry out major national missions in national security, fundamental science, and basic research. They possess unique expertise in stockpile stewardship and nuclear weapons design and development; as well as responsibility for construction of large, complex research facilities such as accelerators for high energy and nuclear physics, research reactors and synchrotron light sources for basic energy sciences and biological research. These laboratories are federal assets with replacement value in the tens of billions of dollars. They are needed to carry out long-term national missions and responsibilities that we cannot "privatize" without jeopardizing the accomplishment of those missions. The Department is the only agency that carries out most of its research in government-owned, contractor-operated laboratories. The need for maintaining continued government ownership of the "already privately operated" facilities, and the lack of industry interest in acquiring them, rest in part on the legal liabilities and environmental cleanup responsibility from the early days of the nuclear weapons program. Long-term, high risk basic research (including large investments in scientific user facilities), national security and waste cleanup account for a large majority of the funding at the laboratories and constitute an appropriate federal role.

Limited experience in "privatizing" R&D laboratories, both in the US and abroad, suggests caution toward any approach that would likely result in the laboratories moving away from long-term research into a "job shop" mentality. While such an approach could have the advantage of near-term savings, federal corporations and wholly private corporations have had uneven track records in the long term. Even if some commercial success is achieved, it could be at the cost of sacrificing important national interests to profits achieved through projects having only short-term payback potential. This could be detrimental in areas such as national defense, fundamental science, basic research and environmental cleanup.

These activities could be "corporatized" through the creation of a not-for-profit corporation, governed by a Board of Trustees, appointed by the President, that would receive multi-year, block-funding from Congress. The Galvin Task Force suggests that such a radical change in governance might better insulate the laboratories from micromanagement and excessive DOE oversight. After careful review, the Department believes that the Task Force's model would be neither practical in the near term, nor sustainable in the long-term. Public comments on this model reveal that this governance model is unrealistic in its funding proposal and inadequate in the expected level of accountability for public funds. Therefore, the Department prefers to follow a two-track approach to the question of governance of the national labs. On the one track, we will continue to explore options raised by the Galvin Task Force. On the second track, we will move aggressively to fix what is broken in the current system - thus striving to reach the same goals envisioned in the Galvin model. As outlined in my testimony to the Committee, we have several important initiatives toward this end already underway.

QUESTION FROM REPRESENTATIVE LEE

Question 7:	Explain the Department's new contract reform efforts, emphasizing the use of performance measure to evaluate laboratories, will result in a more balanced management approach. Also, explain how this reform will resolve problems that the previous reforms did not resolve?
Answer:	Contract Reform has as its objective to fundamentally change the way the Department does business. A cornerstone of the initiative is performance-based management, a concept that the Department is now requiring in all of its contracts, and which fosters the aims of the Department to increase efficiency, reduce costs, maximize competition, and streamline procurement processes.

The development and administration of clearly stated, results-oriented performance criteria and measures are essential elements of performance-based management. This approach encourages innovative and efficient approaches to performing the work by de-emphasizing process-oriented micromanagement, and replacing it with objective positive incentives and negative disincentives tied to performance standards and outcomes. This focus on performance results provides the means to ensure that the quality of the laboratories' scientific, technological, operational, and administrative performance undergoes continuous improvement, while at the same time reducing the need for extensive government oversight.

The contract reform effort is aimed at reversing decades of precedent, and at bringing the Department into the post-Cold War era of new missions and philosophies. Unlike previous reform initiatives, this effort employs such total quality management techniques as customer focus and satisfaction, openness, and widespread and continuous involvement of both internal and external stakeholders. Furthermore, implementation of the initiative is under the express direction of a senior-level Contract Reform Executive Committee.

It should be noted that the Basic Elements of Contract Reform (copy attached) anticipated many of the solutions recommended by the Galvin Report, e.g., performance measures, performance based incentives, increased privatization, requirements for formal cost reduction programs in every contract, streamlined procurement processes, and contract administration that inhibits micromanagement by focusing on purposes and results. These reforms have resulted in cost savings, model contract provisions in newly competed or extended major contracts, new policies on competition and contractor accountability, and most importantly, a pervasive, Department-wide receptivity to new ideas, new structures, new contracting approaches, and new partners.

I am committed to the success of these reforms, and to an enduring spirit of cooperation and partnership with the laboratories.

BASIC ELEMENTS OF CONTRACT REFORM

The following Department of Energy Basic Elements of Contract Reform have been developed in response to the requirement of the Secretary of Energy that Department contracts incorporate "the full range of applicable contract reform provisions." The full range of contract reform is reflected in these elements. Thus they constitute a guide for the development of acquisition strategy, and provide a basis for review and approval of contract actions. Furthermore, they signal the Department's contract reform expectations to present and potential contractors.

Increased Competition

The Department has a strong and consistent commitment to competition at all prime and subcontract tiers, thereby encouraging new offerors to participate in the Department's activities. The Department will seek to mitigate the impacts on workers and communities of Department actions that cause workforce restructuring.

Protection of the Worker, the Public, and the Environment

The safety and health of workers and the public, and the protection and restoration of the environment, are fundamental to the responsibilities of the Department and its contractors, and critical to the success of all of the Department's activities.

Diversity

Individual and institutional diversity is promoted and facilitated through solicitations, contracts, and contract administration, such diversity to involve human resources, contractors, subcontracting with and mentoring of small disadvantaged business and women-owned businesses, etc.

Results-Oriented Statement of Work

Statements of contract work focus on the purposes and outcomes of the work to be performed, and facilitate the development of specific performance criteria and measures to be included in the contract.

Performance Criteria and Measures

Clear, results-oriented statements of programmatic, business management, and ES&H contract performance requirements and quality standards, together with objective measurements of their accomplishment.

Performance Based Incentives

Monetary incentives (e.g., fee) and nonmonetary incentives (e.g., contract duration) are linked to performance criteria, encourage and reward accomplishment of stated performance requirements, and discourage substandard performance.

Greater Financial Accountability

Contractor accountability is based upon a more equitable and rational allocation of costs and risks of performance between the Department and the contractor, particularly in the areas of reimbursement of fines and penalties, third party claims, and loss of or damage to government property.

Improved Financial Management

Department and contractor systems provide the full range of financial information needed for sound decision-making, and clear policies foster improved methods of unallowable cost recovery, and appropriate use of advance funding mechanisms.

Increased Use of FAR-Based Cost Principles

Greater use is made of applicable FAR-based cost principles in Department cost-reimbursement contracts, including non-profit contracts.

Increased Use of Fixed-Price Contracts

Where appropriate and cost-effective, the use of fixed-price prime contracts and subcontracts is maximized.

Cost Reduction

Contractors are encouraged and where appropriate, incentivized, to propose and carry out detailed plans and programs to reduce contract costs.

QUESTION FROM SHEILA JACKSON LEE

Question 8:	Explain DOE's plans as to how they will address overall streamlining and the impacts to diversity programs. Also, please provide percentages and demographic information. What percentages/demographics of DOE's funding support the research efforts at Historical Black Colleges and Universities?
Answer:	The Director of the Office of Economic Impact and Diversity is on the Steering Committee of the Strategic Alignment Initiative to assure that the Department's diversity goals are addressed as streamlining plans are developed and that the Department's diversity successes will be maintained during this period of streamlining. Current and historical gender and race data regarding hiring and employment at the Department reveals that as of September 30, 1994, the total Federal permanent work force at the Department consisted of 17,533 employees. Of the 17,533 employees, 6,651 or 37.92% were women. The work force breakdown by race consisted of 1,784 or 10.18% Black employment; 549 or 3.13% Asian American employment; 877 or 5.0% Hispanic employment; 234 or 1.33% American Indian employment; and 14,315 or 80.36% white employment.

In 1992, the Department of Energy's funding support for research efforts at historically Black colleges and universities represented about .05 percent of the Department's total budget and 1.4 percent of research and development support to all institutions of higher education. Since then, under Secretary's O'Leary's leadership, the Department's funding support for research efforts at historically Black colleges and universities increased to about .08 percent of the Department's total budget and 3.07 percent of research and development support to all institutions of higher education.

QUESTIONS FROM MR. GEREN AND MR. BROWN

Question 1: **The Galvin Report notes that the Department self-regulates laboratory compliance with environmental, health, and safety regulations and concludes that such self-regulation leads to much redundancy and duplication of effort. Have you investigated proposals to submit the laboratories primarily to external regulation on these issues? If so, do you have any plans to act upon such proposals?**

Answer: We agree that this issue should be examined. Accordingly, we established the Advisory Committee on External Regulation of the Department of Energy Nuclear Safety. The purpose of the Advisory Committee is to recommend regulatory reforms to assure existing and new Department facilities are most effectively and efficiently regulated with regard to nuclear safety. The safety functions considered will include facility safety, worker protection, emergency response, and protection of the public and the environment from radiological hazards. The Advisory Committee has been tasked to provide recommendations to the Department regarding external regulation in an interim report within six months and a final report by the end of the year.

QUESTION FROM REPRESENTATIVES GEREN AND BROWN

Question:	**The Galvin Report indicates that DOE relies on 25,000 detailed orders to describe the procedures and processes that the Department must follow. We understand that you have begun an internal effort to eliminate and consolidate as many orders as possible. When do you expect that we will begin to see the improvements and savings that may result from this exercise?**
Answer:	Since March 1994, the 312 departmental directives have been reduced by 25 percent. We are committed to achieving a 50 percent reduction by December 1995. It is anticipated that by June 30, 1995, review and, as appropriate, revisions and eliminations of the highest priority orders, including the 26 orders that have been identified as "burdensome," will be completed.

This accelerated effort has been initiated to consolidate/restate directives with the purpose of reducing the cost, time and complexity placed on implemention of directives and to improve efficiency of operations. As such, significant cost savings and cost avoidance can be expected, and systems are being developed to collect this information. A $100M cost avoidance has been projected for the Department's reduction in internal directives which include $38M estimated from the Capital Asset, Maintenance, and Work for Other orders. We are in the process of developing a system to better capture cost avoidance and cost savings from this directive reduction effort.

QUESTIONS FROM REPRESENTATIVE ZACH WAMP

QUESTION #1: **Following your restructuring and cost saving announcement, it appears that the Department does not intend to maintain its commitment to the cities and counties (i.e. Oak Ridge, Anderson County, Roane County, Tennessee). Is DOE drawing away from or abandoning its commitment to provide in-lieu-of-tax payments and other support for the communities where the top 10 laboratories are located?**

ANSWER: Restructuring the Department of Energy to "work better and cost less" has led to a top to bottom review of its operations and priorities. Lower budgets and resources will certainly lead to some tough decisions to reduce spending. However, we are completely committed to supporting DOE's communities. It is the resources and talents of these communities that enable DOE's National Laboratories to lead the world in technological and scientific research. To continue this record of success, DOE will do all it can to strengthen its community relationships.

Questions/Answers for Representative Zach Wamp

Question 2: How much of the nation's research should be partnershiped with other countries?

Answer There is no way to determine precisely the amount of research that should be partnered with other countries Partnering with other countries depends on an assessment in the case of each proposed project of the related costs and benefits, including the contribution of the proposed cooperative effort to the related program objectives, to Departmental objectives, and to overall U.S. policy objectives The Department of Energy views its energy collaborative arrangements as vital agents of international competitiveness and economic policy, and as a means of leveraging scarce domestic research dollars In deciding to partner with another country , all these factors are considered.

In particular, when the Department is either contemplating a new international agreement or renewing an existing one, it makes an assessment, using the following criteria:

- The agreement and its related activities fit within the mission and objectives of the initiating program office;
- The agreement and its related activities are consistent with and/or further the Department's overall mission and goals and U.S. policy objectives, and

o The agreement and its related activities provide scientific and/or other benefits that merit the costs of the agreement to the Department and the U.S.

In addition, the following related questions also are answered prior to entering into a new collaborative agreement or continuing an existing one. These questions are in line with the criteria listed above:

Criteria 1: List the goals and objectives of the agreement including:

- technical goals and policy goals
- specific outcomes (milestones)
- anticipated products
- other non-technical objectives

Criteria 2: How does this agreement support DOE's Strategic Plan?

- relevance to DOE's International Strategic Plan
- business strategies (industrial competitiveness, energy resources, science and technology, national security, environmental quality)
- critical success factor strategies (communication and trust, human resources, ES&H, management practices)

What are the implications for U.S. global competitiveness?

- will technologies be transferred (in either direction?)
- what are the balance-of-trade consequences?
- will commercialization of U.S. products be accelerated?
- is there potential for commercial loss to U.S. firms?
- will foreign purchase of U.S. goods and services be enhanced?

What are the environmental implications of the activities under the agreement?

Criteria 3: Benefits: What are the identifiable benefits of the agreement? (to the U.S.? to DOE? to bilateral partner?)

- **what economic gains/savings result from the activities? (provide dollar estimates)**
- **what was or will be accomplished that could not be done by the U.S. alone?**
- **what new scientific and technical information was/will result?**
- **what other benefits might flow from this agreement (e.g., time savings, access to unique facilities, etc.)?**
- **what are the potential political benefits?**

Costs: What costs have been and will be incurred?

- manpower costs
- travel costs
- material resources costs
- total budget/funding (amounts, sources, line items)

Are adequate resources available to accomplish the goals and objectives of the agreement? How are the costs shared between bilateral partners? What are the potential political or other non-monetary costs?

An evaluation based on responses to these and similar questions assures that partnering for research is beneficial to the U.S. technically and financially. Several examples of successful international energy collaborative research are available. One such example is the U.S. Canada jointly funded ($20 million each from the U.S. and Canada) project for cooperative testing and technology development in civilian waste management. Canada also provided its underground research laboratory in Manitoba for this project. This mutually beneficial collaborative partnership contributes directly to the Yucca Mountain Site Characterization Project.

QUESTIONS FROM REPRESENTATIVE WAMP

Question 3:	**The Galvin report alleges micro-management by Congress and the Department as the primary cause of inefficiency. If Congress confesses and repents of its sin, will the department also?**
Answer:	The Department has acknowledged its agreement with the findings of the Galvin Committee regarding micromanagement and has already taken action to reduce and improve oversight of the laboratories. Among these actions are: realigning the Department to more effectively interface with the laboratories; instituting performance based contracts for the laboratories; committing to establish a performance based management system; eliminating the concept of the "federal norm" in laboratory subcontracting (that is, the procurement rules and regulations that apply to the Federal Government and instead relying on best business management practices) and reducing both the scope and number of departmental orders which guide laboratory operations.

Questions from Representative Rohrabacher

Question 1:	On page 1 of your prepared testimony, you state: "In the spring of 1993, we initiated the most comprehensive strategic planning effort ever undertaken by the Department. Through a lengthy and intensive process involving hundreds of employees from all parts of the Department, its laboratories and facilities, a strategic plan was developed which presents a shared vision for the Department into the 21st Century." Please provide a copy of that strategic plan for the hearing record.
Answer:	A copy of the Department's Strategic Plan is attached for the record.

FUELING A COMPETITIVE ECONOMY

STRATEGIC PLAN

UNITED STATES
DEPARTMENT OF ENERGY

[illegible]

OUR CORE VALUES

We have developed the following core values which will allow us to fulfill our vision.

1. **We Are Customer-Oriented**
    - Our decisions and actions are responsive to the customer's needs.
    - We foster a participatory way of doing business in which the opinions and input of diverse stakeholders are sought and considered prior to making decisions.
    - Policies to address major challenges are developed in a proactive, collaborative way with our customers and stakeholders.

2. **People Are Our Most Important Resource**
    - We value the needs of individuals.
    - We are committed to improving the knowledge, skills, and abilities of our employees by providing opportunities for professional development and achievement.
    - We are committed to providing a safe and healthy workplace for all our employees and contractors.
    - We value the richness, experience, and imaginative ideas contributed by a diverse workforce.
    - We share credit with all contributors.
    - We value listening as an essential tool in learning from others.
    - Employees are forthright in sharing their experiences so we can learn from each other.

3. **Creativity and Innovation Are Valued**
    - We are committed to a flexible operating environment that facilitates the pursuit of new technologies, processes, programmatic approaches, and ideas that challenge the status quo.
    - We seek out, nurture, and reward innovation in daily activities, ranging from the routine to the complex.
    - Employees are empowered to pursue creative solutions.
    - Resourcefulness, efficiency, and effectiveness are recognized and well regarded.
    - Adaptable, entrepreneurial approaches that can respond quickly to the rapidly changing world business and political environment are essential.

4. **We Are Committed to Excellence**
    - Quality and continuous improvement are essential to our success.
    - We are committed to excellence in everything we do.
    - Through scientific and technical excellence, we are committed to enhancing the Nation's ability to compete globally.

5. **DOE Works as a Team and Advocates Teamwork**
    - We reinforce the notion of a common or greater departmental good and encourage interdepartmental teamwork to achieve this goal.
    - We value teamwork, participation, and the pursuit of win/win solutions as essential elements of our operating style.
    - We work as a team with other Federal agencies, government organizations, and external stakeholders in pursuing broader national objectives.
    - We recognize the needs of others for information, and we communicate knowledge and information in an open and candid manner.

6. **We Respect the Environment**
    - We will be a leader in improving the quality of the environment for future generations.
    - We recognize the importance of the environmental impacts of our operations, and we develop and employ processes and technologies to reduce or eliminate waste production and pollution in these operations.
    - We place high priority on the protection of public health and safety and restoration of the environment through cleanup of environmental damage caused by past operations.

7. **Leadership, Empowerment, and Accountability Are Essential**
    - We are visionary in our everyday activities.
    - Leaders trust and support individuals to make informed decisions about the processes they own.
    - We are effective stewards of the taxpayer's interests.
    - Our actions are result-oriented.

8. **We Pursue the Highest Standards of Ethical Behavior**
    - We maintain a personal commitment to professionalism and integrity.
    - We assure conformance with applicable laws, regulations, and responsible business practices.
    - We keep our commitments.
    - We are objective and fair.

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TABLE OF CONTENTS

	Page
Message from the Secretary	ii
The Department of Energy's Strategic Outlook	1
The World Has Changed	1
The Strategic Response	2
Our Unique Capabilities	2
Our Mission	4
Vision	4
Core Values	5
The Total Quality Philosophy	5
DOE's Five Businesses	5
DOE's Critical Success Factors	7
Key Customer and Stakeholder Considerations	7
Situation Analysis	8
The Business Strategies	12
Industrial Competitiveness	12
Energy Resources	14
Science and Technology	17
National Security	20
Environmental Quality	24
The Critical Success Factor Strategies	27
Communication and Trust	27
Human Resources	29
Environment, Safety, and Health	31
Management Practices	34
Updating the Strategic Plan	37

MESSAGE FROM THE SECRETARY

The Department of Energy has a rich heritage of meeting important national goals in the areas of energy, national security, science, and technology. The end of the Cold War, and the election of President Clinton, have given us a new national agenda. Through a comprehensive strategic planning process, we have determined that the Department must now unleash its extraordinary scientific and technical talent and resources on new and more sharply focused goals: fueling a competitive economy, improving the environment through waste management and pollution prevention, and reducing the nuclear danger.

These goals cut across our program areas, core competencies, and disciplinary expertise. Tackling them requires a commitment to teamwork throughout the Department and our Administration, with the goal of a high level of integration across departmental business lines. We need the advice and thinking of our customers and stakeholders. We need new partnerships with communities, other Federal agencies, academia, State and local governments, and industry.

This strategic plan is an initial step in an ongoing effort to define and integrate the business activities of the Department of Energy. The plan helped shape the fiscal year 1995 budget and will play a central role in shaping future budgets.

In addition to redefining what our business lines are, we are changing how we do business. Critical to our success has been an innovative approach to communication and trust, human resources, environment, safety, and health, and management practices. We embrace continuous quality improvement as the only path to successful change.

The goals, strategies, and performance indicators presented in this plan will allow us to measure progress toward our new vision—a vision of providing bold leadership in addressing some of the Nation's most important needs. I look forward to working with you to make this strategic plan a reality.

Hazel R. O'Leary

Hazel R. O'Leary
Secretary of Energy

THE DEPARTMENT OF ENERGY'S STRATEGIC OUTLOOK

THE WORLD HAS CHANGED

This Administration was elected with a new mandate and vision for America: our challenge is to move away from the Cold War economy, invest in people and technology to strengthen the economy and protect the environment, and reinvent a government that is efficient, serves the American people, and provides more services with fewer resources.

This strategic plan realigns and integrates the Department's unique scientific and technological assets to achieve this vision.

The Department's first priority is to help the President achieve his vision of an investment-driven economy capable of creating high-wage jobs that increase the incomes of the American people. That requires a strategy for empowering and utilizing the Department's tremendous scientific and technological assets—30,000 scientists and engineers, including 58 Nobel Prize winners, at laboratories with a capital value of $30 billion—to help U.S. industry compete in a global economy. The Department has a unique role in reconciling economic, energy, and environmental goals by helping industry develop environmentally conscious processes, technologies, and materials.

Only recently have the public and policy makers begun to understand inter-relationships between energy production and use, and its impact on the environment and economic growth. We are shifting our energy research and development focus to capitalize on the massive markets at home and abroad for sustainable energy technologies that create jobs by emphasizing energy efficiency and commercializing renewable resources, and to ensure that we use fossil fuels economically and cleanly.

The end of the Cold War has given us a new set of challenges to address in our national security mission: nonproliferation, the safe dismantlement of nuclear weapons, and maintenance of the stockpile without nuclear testing. The old danger was the threat of nuclear conflict. The new danger is proliferation of nuclear weapons and materials into the hands of rogue states and terrorist groups. The Department is addressing these challenges through the innovative and broad application of our assets.

Nuclear weapons production created an estimated $300 billion cleanup legacy that is, today, the single largest environmental program in history. We are now redirecting the same national commitment that built our nuclear arsenal toward addressing the resulting environmental and safety risks at thousands of contaminated sites. We can succeed in this mission only by meaningfully involving States, Native American Nations, and citizens in the decision-making process, by developing new technologies to clean up sites, and by reducing future costs through new strategies for minimizing waste and preventing pollution.

Just as changes in the world demand a strategic response to what we do, they require a strategic response to how we do it. The shift in our national security mission requires a strategy for replacing secrecy with openness. Similarly, we are moving from a reactive approach to environment, safety, and health concerns to a proactive approach.

Finally, one of the biggest changes is that this Administration is serious about reducing the Federal budget deficit, which means we must take on our new missions and deliver more results with less money. This requires a strategy for adopting the best management, human resources, and environmental, safety, and health practices of the private sector: total quality management, defect prevention, diversity, and customer responsiveness.

THE STRATEGIC RESPONSE

Recognizing these changes in the world, and our need to change with them, led to the massive reshaping of our missions, priorities, and business practices. Tinkering around the edges was not enough—we had to start anew.

Our response to this challenge began in the summer of 1993 with an empowerment summit at Motorola-Milliken Quality Institute to address these issues. Through a total quality management learning experience and through listening to citizens, business groups, our neighbors, and our industry partners, we agreed that dramatic change was required, not only in the Department's business lines but in how we managed our business. The Department's strategies for an ongoing planning process emerged from those meetings.

Continuous quality improvement is the only path to successful change.

The strategic planning process, led by Susan Tierney, the Assistant Secretary for Policy, Planning, and Program Evaluation, has been the most ambitious and wide-ranging planning exercise in the history of the Department of Energy. We began by breaking down the walls and barriers that isolated our business lines. For the first time, we challenged everything we do. The process included all of the Department's leadership, hundreds of career employees from headquarters and the field, our national laboratories, and external stakeholders. It was the highest priority activity for all involved.

The results of this process have been far-reaching. The words that follow explain a new Department of Energy, an organization with new priorities and a sense of purpose, a new vigilance, and a culture and values that will bear no resemblance to the previous organization that grew out of the Cold War.

The vision, priorities, and strategies that emerged from this process are detailed in this plan. They have already been used to realign the Department's fiscal year 1995 budget. As this plan evolves, the process will reach out even further to involve additional customers and stakeholders. It is the roadmap to guide the Department's conscience, policies, and decision-making in the years to come.

OUR UNIQUE CAPABILITIES

A critical step in our strategic planning process was to inventory our existing capabilities. What we found was that the Department of Energy has developed a mix of core competencies that make it uniquely suited to advance science and technology to fuel a competitive economy, secure clean, reliable energy resources, improve the global environment, and reduce the nuclear danger.

The Department of Energy's roots can be traced to the Manhattan Engineer District of the U.S. Army Corps of Engineers, which was established in 1942 to manage development of the atomic bomb. After World War II, Congress created the Atomic Energy Commission in 1946 to direct the design, development, and production of nuclear weapons.

The Atomic Energy Commission was also responsible for developing nuclear reactors, and, in later years, regulating the commercial nuclear power industry. Contributions from these early efforts included isotope power sources for space missions, nuclear medicine, and high speed computers.

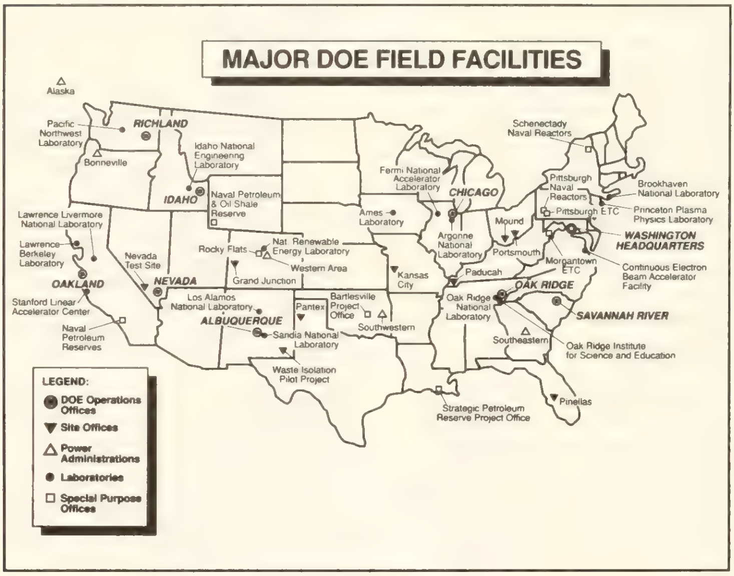
In 1975, Congress replaced the Atomic Energy Commission with two new agencies: the Nuclear Regulatory Commission and the Energy Research and Development Administration, created to manage the nuclear weapons, naval reactor, and energy development programs, and to research the environmental, biomedical, and safety aspects of energy technologies.

In 1977, Congress created the Department of Energy, which brought together functions and responsibilities of the Energy Research and Development Administration and units of several other agencies under one cabinet-level department.

The Department's unique energy-, defense-, and research-related responsibilities have led to distinctive and singular scientific and engineering core competencies including:

- Energy and environmental technologies.
- Advanced materials development.
- Advanced manufacturing and process technology.
- High-performance computing and communications.
- High energy and nuclear physics.
- Bioscience and biotechnology.

The Department of Energy manages a major part of the Nation's Federally funded civilian science, technology development, and engineering resources, consisting of 9 major


MAJOR DOE FIELD FACILITIES
Alaska
Pacific Northwest Laboratory
RICHLAND
Bonneville
Idaho National Engineering Laboratory
IDAHO
Naval Petroleum & Oil Shale Reserve
Lawrence Livermore National Laboratory
Lawrence Berkeley Laboratory
Nevada Test Site
OAKLAND
NEVADA
Stanford Linear Accelerator Center
Naval Petroleum Reserves
Rocky Flats
Nat. Renewable Energy Laboratory
Western Area
Grand Junction
Los Alamos National Laboratory
ALBUQUERQUE
Sandia National Laboratory
Waste Isolation Pilot Project
Pantex
Bartlesville Project Office
Southwestern
Kansas City
Ames Laboratory
Fermi National Accelerator Laboratory
CHICAGO
Argonne National Laboratory
Mound
Portsmouth
Paducah
OAK RIDGE
Oak Ridge National Laboratory
Southeastern
Oak Ridge Institute for Science and Education
SAVANNAH RIVER
Strategic Petroleum Reserve Project Office
Pinellas
Schenectady Naval Reactors
Pittsburgh Naval Reactors
Pittsburgh ETC
Morgantown ETC
Brookhaven National Laboratory
Princeton Plasma Physics Laboratory
WASHINGTON HEADQUARTERS
Continuous Electron Beam Accelerator Facility
LEGEND:
DOE Operations Offices
Site Offices
Power Administrations
Laboratories
Special Purpose Offices

multi-program laboratories, 10 single-purpose laboratories, 11 smaller special-mission laboratories, and a wide range of special user facilities critical to U.S. industry's global competitiveness.

In fiscal year 1994, the Federal Government's total funding for research and development was $72 billion, spread across 24 agencies. The Department of Energy's share of this research, $7 billion, is the fourth largest and represents almost 10 percent of the total Federal spending.

Recent breakthroughs emanating from the Department's system of laboratories include:

- The world's record in photovoltaic energy conversion efficiency at the National Renewable Energy Laboratory.
- The world's record for fusion power levels produced at the Princeton Plasma Physics Laboratory.
- The world's most powerful source of "soft" x-rays at the Lawrence Berkeley Laboratory.

The Department has extended its basic science with a new emphasis on applied research and partnering with industry. This is best exemplified by the Clean Car Initiative, a Cooperative Research and Development Agreement, negotiated with General Motors, Chrysler, and Ford to develop efficient, clean vehicles that are practical and affordable. Other examples of innovative partnerships include DOE defense technology that is now being used to reduce medical radiation doses and provide better images of mammograms, a broad-based partnership with the integrated textile industry (AMTEX), and a new process for soldering printed circuit boards that eliminates the use of ozone-depleting chemicals while saving energy.

We are the leading Federal agency in patent applications with more than 1,000 from 1990 to 1992, as well as the leading agency in licenses granted with more than 400 during that same period. As an example, the Los Alamos National Laboratory developed and patented an acoustic resonant ultrasound spectroscopy technology to detect defects in aircraft wheels and that is now being used to determine the structural integrity of bridges throughout the Nation.

In 1993, the Federal Government received 34 "R&D 100 Awards" given annually for the most important inventions—DOE won 26 of them. An example of an award from 1992 is the solar water detoxification system which has become part of a Cooperative Research and Development Agreement with industry. The system uses sunlight and a nontoxic catalyst to destroy hazardous organic substances in groundwater and industrial waste water.

OUR MISSION

We possess the human and physical assets to achieve the mission that follows:

> ***The Department of Energy, in partnership with our customers, is entrusted to contribute to the welfare of the Nation by providing the technical information and the scientific and educational foundation for the technology, policy, and institutional leadership necessary to achieve efficiency in energy use, diversity in energy sources, a more productive and competitive economy, improved environmental quality, and a secure national defense.***

VISION

By the turn of the century, the Department of Energy through its leadership in science and technology will continue to advance U.S. economic, energy, environmental, and national security by being:

- A key contributor in ensuring that the United States leads the world in developing, applying, and exporting sustainable, clean, and economically competitive energy technologies.
- A key contributor in maintaining U.S. global competitiveness through leadership in environmentally-conscious materials, technologies, and industrial processes.
- A major partner in world class science and technology through its national laboratories, research centers, university research, and its educational and information dissemination programs.
- A world leader in environmental restoration, waste management, and pollution prevention.
- A vital contributor to reducing the global nuclear danger through its national security and nonproliferation activities.
- A safe and rewarding workplace that promotes excellence, nurtures creativity, rewards achievement, and is results-oriented and fun.

CORE VALUES

The Department will succeed only through the efforts of its people. How well we perform individually and collectively is a function of the beliefs and values that motivate our behavior. The employees of the Department of Energy have chosen the following core values to serve as guideposts and our conscience in fulfilling our mission and achieving our vision.

1. We are customer-oriented.
2. People are our most important resource.
3. Creativity and innovation are valued.
4. We are committed to excellence.
5. DOE works as a team and advocates teamwork.
6. We respect the environment.
7. Leadership, empowerment, and accountability are essential.
8. We pursue the highest standards of ethical behavior.

THE TOTAL QUALITY PHILOSOPHY

Our core values will define our culture. Our culture will help us achieve our vision to fuel a competitive economy. A philosophy of total quality management and continuous improvement will serve as the foundation to meet the needs of our customers and allow us all to maximize our potential and make work rewarding.

Total quality will be achieved through customer satisfaction, leadership commitment, continuous improvement, labor/management partnering, and employee involvement. Our journey towards total quality has already begun, and there are many important efforts underway that support this new approach. Examples include customer service plans, process improvement teams, leadership training to support our core values, and implementation of total quality guidelines.

Employees and management working together on these key initiatives will empower all of us to improve customer satisfaction, focus our energy on value-added products and services, and make our jobs more rewarding.

DOE'S FIVE BUSINESSES

In response to world changes and today's new challenges and priorities, we took a fresh look at our business lines. What we found were mission areas that operated in a vacuum from one another. There was little synergy or integration of departmental assets. In general, little communication across organizational lines occurred. We found an organization structured to meet demands and challenges that were no longer relevant. We recognized that our science and technology capabilities had not been strategically leveraged. We decided to fundamentally reorient both the nature of our businesses and how they were managed.

Through our strategic planning efforts, we identified five businesses that most effectively utilize and integrate our unique scientific and technological assets, engineering expertise, and facilities for the benefit of the Nation. These new businesses which directly affect the security and the quality of life of every American, are:

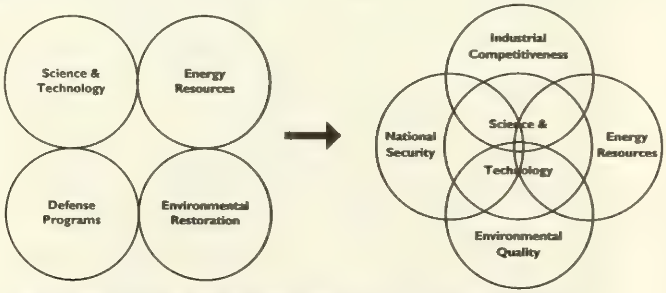
Industrial Competitiveness: Promote economic growth and the creation of high-wage jobs through research and development partnerships with industry, drive products into the domestic and international marketplace, and help industry become more competitive by cost-effectively shifting from waste management to resource efficiency and pollution prevention.

Energy Resources: Encourage efficiency and advance alternative and renewable energy technologies; increase energy choices for all consumers, assure adequate supplies of clean, conventional energy, and reduce U.S. vulnerability to external events.

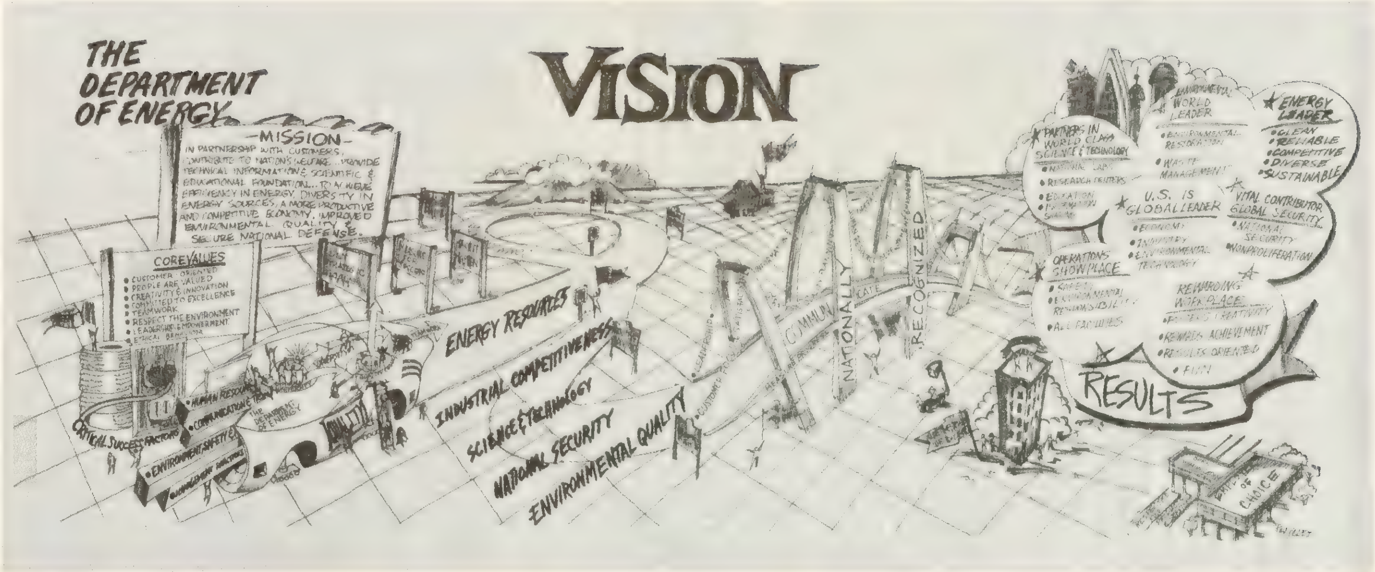
Science and Technology: Use the unique resources of the Department's laboratories and the country's universities to maintain leadership in basic research, increasingly focus applied research in support of the Department's other business lines, and maintain world technical leadership through long-term, systemic reform of science and mathematics education.

National Security: Effectively support and maintain a safe, secure, and reliable enduring stockpile without nuclear testing, safely dismantle and dispose of excess weapons, and provide the technical leadership for national and global nonproliferation activities.

Environmental Quality: Understand and reduce the environmental, safety, and health risks and threats from DOE facilities and decisions, and develop the technologies and institutions required for solving domestic and global environmental problems.



The Department Has Fundamentally Reoriented Its Business Lines For The Benefit Of The Nation.



THE DEPARTMENT OF ENERGY

-MISSION-

IN PARTNERSHIP WITH CUSTOMERS, CONTRIBUTE TO NATION'S WELFARE ...PROVIDE TECHNICAL INFORMATION & SCIENTIFIC & EDUCATIONAL FOUNDATION... TO ACHIEVE EFFICIENCY IN ENERGY, DIVERSITY IN ENERGY SOURCES, A MORE PRODUCTIVE AND COMPETITIVE ECONOMY, IMPROVED ENVIRONMENTAL QUALITY & SECURE NATIONAL DEFENSE.

COREVALUES

- CUSTOMER ORIENTED
- PEOPLE ARE VALUED
- CREATIVITY & INNOVATION
- COMMITTED TO EXCELLENCE
- TEAMWORK
- RESPECT THE ENVIRONMENT
- LEADERSHIP-EMPOWERMENT
- ETHICAL BEHAVIOR

DOE'S CRITICAL SUCCESS FACTORS

Working together, we recognized that for our business lines to produce results for the American people, our organizational systems needed realignment and integration. We have identified four critical success factors that must be integrated into our five business lines. These critical success factors are:

Communication and Trust - how we communicate information and build trust within the organization and with our stakeholders and customers.

Human Resources - how we recruit, train and develop, reward performance, motivate, and promote diversity within our workforce.

Environment, Safety, and Health - how we ensure the safety and health of workers and the public, and protect and restore the environment.

Management Practices - how we allocate, spend, and account for resources and procure, produce, and contract for goods and services—the tools we use to get it all done.

KEY CUSTOMER AND STAKEHOLDER CONSIDERATIONS

DOE's customers and stakeholders include the U.S. taxpayer; the energy consumer, the energy producer, the energy regulator, and the energy investor; citizens who live near DOE facilities; the businesses who work with DOE laboratories, or who are affected by their products; the family of DOE employees, laboratories, universities, contractors, and suppliers; Federal agencies, State and local governments and Native American Nations; the Congress; the President and his Administration; foreign governments; and the news media and interest groups.

Our most important customers are the next generations.

Our most important customers are the next generations, to whom we wish to leave a more prosperous and secure world.

Our customers and stakeholders have many concerns:

- The public demands more accountability in government actions and spending. They expect more results at lower cost.
- There is widespread national and international concern about the management and disposition of excess worldwide nuclear weapons and their components following the end of the Cold War.
- The resolution of civilian and defense radioactive waste disposal alternatives will require more meaningful and innovative stakeholder participation than in the past.
- Public opposition to the siting of new energy-related facilities is complicating the Nation's energy infrastructure.
- The public's questioning of its support for basic science creates a challenge for the Nation because our knowledge-based economy has historically benefited from science's contribution.
- The Department's current approach toward increasing industrial competitiveness does not reach a sufficient number of small businesses. A better technology deployment infrastructure is needed.
- The public and business communities are increasingly concerned about how we reconcile the goals of economic growth and job creation with environmental quality goals.

SITUATION ANALYSIS

What are the key factors in today's world affecting the future of the Nation and the Department's programs? A situation analysis for each of the five businesses and four critical success factors is summarized as follows:

Businesses

Industrial Competitiveness. Industrial competitiveness requires partnering with industry and other Federal agencies to put the vast scientific and technological assets of the Department and its laboratories and facilities to the best use in advancing the U.S. position in a global market that is increasingly competitive. Continued scientific and technological innovation is the key to sustaining long-term economic growth to the year 2010 and beyond.

High-wage jobs will be created by economic growth based on technological innovation. At the same time, a cleaner environment will result from continued DOE-led research in energy and material efficiency for industrial processes. Industrial resource efficiency prevents pollution and increases competitiveness by improving overall process efficiency, while simultaneously helping to promote the knowledge-based jobs that are the key to enduring economic success. This technology strategy is also the key to sustainable development.

Enhancing energy efficiency is good for the economy, the environment, and the Nation's security.

Over the next 30 years, there will be a huge international market for energy efficient, renewable energy, and environmental technologies. As developing nations invest in new industrial infrastructure to fuel growth, there will be a growing emphasis on clean manufacturing processes, as well as continued interest in cleanup and waste management. The Department's goal is to assist industry in developing these technologies so that U.S. firms can take advantage of these opportunities.

The Department of Energy is well positioned to provide substantial contributions to industrial competitiveness and environmental quality, although achieving the potential will be a continuing challenge. This challenge will include continuous process improvement in developing strategic partnerships with industry, close coordination and teaming with other Federal agencies, a more focused use of our national laboratories, and disciplined attention to quality management principles.

Energy Resources. A strategic energy policy is essential to promoting economic growth, high-wage jobs, and energy security while preserving the environment. Improving the efficiency with which the Nation uses energy is essential to reconciling these goals. The Energy Policy Act of 1992 will provide guidance in achieving our energy objectives, although fulfilling its requirements will be difficult in this era of fiscal constraint. Enhancing energy efficiency is good for the economy, the environment, and the Nation's security, and is clearly the number one energy priority of this Administration.

Fossil fuels will remain critical components of energy supply in every nation for the foreseeable future. Domestically, coal, natural gas, and oil will continue to provide the majority of energy for electricity generation and the buildings, industrial, and transportation sectors. We must focus on using these fossil fuels more efficiently and cleanly.

The Nation's dependence on oil imports is increasing significantly. This dependency may be reduced by increasing the efficiency of energy use in buildings, appliances, production processes and equipment, and in the transportation sector; greater use of renewables and alternative fuels; and boosting American production through the Domestic Natural Gas and Oil Initiative including enhanced investments in technology research and market expansion. At the same time, we must keep open all supply options to maintain the flexibility to respond to dynamic market conditions.

One way the Federal Government can set an example for the Nation is through the improved energy management of its buildings and facilities and the wider use of energy-efficient, alternative fuel vehicles. Additionally, the President's Climate Action Plan will provide a catalyst for mobilizing the public/private cooperation necessary to increase the use of energy efficiency and renewable energy.

Science and Technology. Investments in research and development have a strong influence on long-term productivity and high-wage job growth. As the United States prepares to compete in a dynamic global economy, it must lead in knowledge-based skills. This requires that both government and industry significantly invest in basic and applied science and the facilities, infrastructure, and trained work force to support technological leadership. Federal spending is constrained, however, so the Department must carefully balance its investments in long-term fundamental research against research and development with a near-term payoff.

Science and technology provide the knowledge that drives our future.

Careful management of the scientific portfolio is particularly important as American companies are increasingly using corporate funds for short-term development and improvements of their products and services while cutting back on long-term research. The challenge to the Department's science and technology programs is to help industry compete effectively in the near-term and also to meet their need for long-term research while providing the accountability and environmental responsibility expected by the public. This has become increasingly important as industry continues to shift away from basic research.

National Security. The end of the Cold War and the collapse of the Soviet Union require a profound change in the nature of the Department's nuclear weapons complex and a strengthening of our nuclear nonproliferation activities. The nuclear weapons complex was created to yield large numbers of increasingly sophisticated weapons. The complex must be transformed into a system whose purpose is to reduce the nuclear danger. This transformation will enable some of the science and technology of the DOE weapons laboratories and facilities to be redirected to help meet new needs, both domestically and abroad, such as flexible, clean, energy-efficient manufacturing.

The Department foresees a future national security environment in which there will be significant numbers of nuclear weapons in a still risky and chaotic world. In this environment, the United States will continue to rely on nuclear deterrence and a nuclear-powered navy. We are committed to a science-based program to maintain the nuclear stockpile without testing, safely dismantle nuclear weapons, achieve a comprehensive test ban treaty, extend the Nuclear Nonproliferation Treaty, and counter the proliferation of weapons of mass destruction.

Recognizing that openness is essential to accountability and trust, we will take an aggressive approach to declassify information about the Department's activities while maintaining the Nation's security.

Environmental Quality. The Administration is committed to honoring the Government's obligation to address the legacy of the U.S. nuclear weapons complex and high-level nuclear waste from nuclear power plants in order to protect human health and safety and the environment. We are determined to achieve those objectives efficiently and cost-effectively, which will require continued management reforms. At the same time, we will use pollution prevention to reduce the Department's ongoing waste streams.

DOE has responsibility for 137 sites nationwide. Portions of the over 3,300 square miles of lands managed by DOE contain contaminated soil, groundwater, and structures. As the weapons complex is downsized, facilities no longer needed will be decommissioned and decontaminated—a formidable task compounded by a lack of adequate environmental technology and a complex regulatory regime.

We must include the public in frank discussions of risk, resources, and priorities. Still, the increasing clash between the legal requirements relating to the Department's environmental activities, the current technical limitations of technologies and risk knowledge, and the Nation's ability to pay may jeopardize the Department's environmental quality goals.

Critical Success Factors

The Department's five business lines represent the activities the Department will be engaged in. However, a successful business requires much more than understanding products and priorities. Critical to success is the integration of communication and trust; effective human resource management; a genuine concern for the environment, safety, and health of our workers and the public; and highly efficient management practices into everything we do. The following areas discuss these critical success factors.

Communication and Trust. The Department is undergoing a transformation from a secretive, weapons producing agency, little understood outside of Washington, to a service-oriented, customer-driven leader in science, technology, and environmental management. That transformation mandates a change in culture—a new emphasis on openness, communication and trust. Only an open and accountable government will achieve the level of public trust needed to address complex problems such as the management of plutonium and redirection of our national laboratories.

Trust results from open and honest communication.

Every action DOE takes from now on must be considered a communication that can enhance or hinder the trust of the American people. Behaviors that encourage trust to grow can and must be required. We must be responsive to the growing public demand for the declassification of millions of pages of DOE documents with a special focus on nuclear weapons testing, experimentation with radioactive materials, and environmental releases and contamination.

Human Resources. The Department seeks greater alignment of resources with agency priorities and increased diversification of the workforce, including gender, ethnicity, age, and skills. This diversification will bring new thinking and perspectives that heretofore have not had a voice in departmental decision-making. We seek flat organizations, fewer levels of management, empowered employees, and lessened regulation by oversight agencies so we can rapidly respond to today's challenges and meet public needs.

Barriers to achieving human resources' goals include resource constraints, a complex personnel system, competition for diversity talent, limited management commitment and accountability, lack of trust, individual over corporate interest, and lack of an effective mechanism to reallocate resources and retrain individuals.

Environment, Safety, and Health. In addition to the Department's environmental problems, safety and health concerns are formidable. The Department has limited public health expertise, insufficient worker medical surveillance programs, and inadequate safety training in the workplace. We are committed to improve policies, programs, and professional expertise in key areas such as occupational medicine, risk management, and data management.

We are shifting from a reactive approach to environment, safety, and health to one that emphasizes prevention. All departmental businesses are proactively ensuring that there is no compromise in public and worker safety.

Increasing external regulation is an opportunity to improve the Department's performance and credibility. Meaningful and value-added independent regulation can serve to clarify requirements and can provide a framework for more disciplined internal responsibilities and actions. External regulation promotes transparency and public involvement. Efforts are accelerating to improve information access, "open up" the Department's records related to environment, safety and health, and improve external relationships.

Management Practices. The Department has over 800 separate systems for managing its operations, which limit the Department's flexibility. DOE must become more streamlined and agile. Change is needed in information systems, procurement and contracting, planning and budgeting, financial management, directives management, and project and facilities management.

The Department has not been customer oriented. Meeting or exceeding all of our customers' reasonable expectations requires integrated, cost-effective, "open" management systems that are easy to understand and free of manipulation.

The Department will continue to contribute to the Administration's deficit reduction objectives through savings resulting from the realignment of its mission priorities, its focus on customer service and total quality management, its contract reform initiatives, and its leadership role in support of the reinventing government initiative. In short, we intend to achieve greater results with less money.

THE BUSINESS STRATEGIES

The efforts of the Department's five business strategic planning teams are summarized in this section. The action plans to achieve these goals are included in each of the team's actual strategic plans.

INDUSTRIAL COMPETITIVENESS

The Department of Energy has an essential role to play in assisting U.S. economic competitiveness as a result of its unique laboratory system and research and development (R&D) capabilities. DOE's laboratories and facilities have expertise in many areas that are critical to major high-technology industries and services and to reconciling economic and environmental goals.

DOE's core competencies include energy and environmental technologies, advanced materials development, high-performance computing and communications, and advanced manufacturing. These competencies have provided the basis for unprecedented growth over the past few years in collaborative research and development activities between the

Partnership: General Motors, Advanced Engineering Technology Group, and Los Alamos National Laboratory executives describe a fuel cell being jointly developed for automotive use to President Clinton and Secretary O'Leary.

Department and the private sector. Although most of these collaborative agreements are multi-year partnerships that were initiated in only the past two years, many already have proven successful at generating commercial products, improving market share, and creating jobs.

Help industry sustain long-term economic growth that has created high-wage jobs and a cleaner environment.

Through these interactions, the Department and the laboratories have gained a great deal of experience that now must form the basis for moving to a new, highly-integrated, and strategic approach for DOE's overall interactions with the private sector.

VISION

In the year 2010, the Department of Energy uses its leadership in energy, science, and technology to help industry sustain long-term economic growth that has created high-wage jobs and a cleaner environment. Because of our record of success, industry seeks out DOE as an innovative and productive partner. Working together, DOE, industry, and other Federal agencies have made the U.S. economy the most productive in the world in its use of energy, material, and human resources.

GOAL 1

Help industry shift from waste management to resource efficiency and pollution prevention.

STRATEGIES

- Develop resource efficient, pollution prevention, renewable energy, and other clean technologies.
- Coordinate Federal activities to establish roles and responsibilities.
- Help industry expand global market share.
- Work with the technological, financial, and regulatory communities to overcome barriers to the adoption of clean technologies.

SUCCESS INDICATORS

- Decrease in energy use, amount of raw materials, and generation of waste per unit of Gross Domestic Product.
- Increase in U.S. industries' share of global market for clean technologies.

GOAL 2

Establish DOE as industry's R&D provider of choice in its areas of scientific and technical competency.

STRATEGIES

- Develop integrated R&D program plans with industry, including technology roadmaps.
- Maximize integration of R&D partnerships across DOE through co-planning and co-funding.
- Develop consistent, reliable, standardized, and fair policies and procedures across the Department and its facilities so that access by potential partners is simplified.
- Develop a communications strategy that helps industry know which resources are available within the Department and where.
- Provide timely and reliable technology partnership funding, and ensure prompt decision-making regarding such funding, across all departmental programs and offices.

SUCCESS INDICATORS

- Increase in number of jobs created and value of products created from R&D partnerships.
- Increase in total annual amount of non-Federal resources applied to mission-related research through R&D partnerships.
- Increase in number of new or extended agreements entered into by past participants as a measure of repeat business.
- High marks on industrial partner surveys of DOE performance.

GOAL 3

Maintain core competencies and leverage resources by partnering with private sector and other agencies for dual benefit, two-way technology exchange.

STRATEGIES

- Develop a budget structure and business strategies that support DOE's technology infrastructure.
- Work with the Administration and Congress to advance dual-benefit work with industry.
- Make access to DOE facilities easier for Federal, State, and local agencies.
- Establish regional programs to retrain and maintain skills of national security and other workers affected by program transitions.

SUCCESS INDICATORS

- Increase in number and value of new or enhanced products/processes created and used by industry.

GOAL 4

Accelerate national use of available and emerging competitive technologies, processes, and practices.

STRATEGIES

- Make DOE laboratories and facilities available as an integrated technical resource for existing manufacturing extension and technology outreach systems, such as those managed by the Department of Commerce.
- Develop, test, and pursue a portfolio of deployment programs.
- Work with other agencies to address institutional barriers.

SUCCESS INDICATORS

- Increase in degree of customer satisfaction reported by program participants.
- Increase in number of businesses accessing informational and/or technical assistance through deployment programs and number of repeat customers.
- Increase in geographical distribution and diversity of businesses reached.

ENERGY RESOURCES

Energy fuels a competitive economy. Strategic energy policy can lead to the creation of high-wage jobs, an improved national and global environment, and reduced vulnerability to supply disruptions. In *A Vision of Change for America*, President Clinton states, "The Administration will launch initiatives to develop new, clean, renewable energy sources that cost less and preserve the environment. We will also encourage energy efficiency and conservation to lower the energy bill of middle-class Americans, and lessen our vulnerability to events outside our control."

Sunrayce '93; congratulating a driver for University of Michigan's winning team. DOE sponsors this biennial student built solar car cross-country collegiate competition, which challenges science, math, and engineering students and promotes scientific competition.

VISION

Energy services are needed for a wide range of valued human activities. To meet these needs, they must be reliably and fairly available at low environmental and economic costs. In our vision for the year 2010 and beyond, the United States will be a worldwide leader in the development, application, and export of sustainable, environmentally attractive and economically competitive energy systems—and will have in place a flexible, clean, efficient, and equitable system of energy supply and end-use, with minimum vulnerability to disruption.

GOAL I

Enhance energy productivity to strengthen the United States economy and improve living standards.

STRATEGIES

- Accelerate energy efficiency in all sectors cost-effectively.
- Promote programs that will establish the United States as a world leader in developing and deploying energy technologies and services throughout the world.
- Achieve a major gain in the value of exports of energy technologies and services compared to imports.

- Emphasize and promote more open and efficient energy markets, reflective of social costs.

SUCCESS INDICATORS

- Amount of energy saved.
- Reduction of energy use per dollar of U.S. Gross Domestic Product.
- Increase in total jobs created directly and indirectly by DOE investments.
- Total increase in U.S. Gross Domestic Product created directly and indirectly by DOE investments.

GOAL 2

Ensure reliable energy services with reduced vulnerability to energy price and supply volatility.

STRATEGIES

- Facilitate the acceptance of greater diversity of competitive energy sources and technologies into the marketplace.
- Increase reliance on risk-sharing mechanisms using a systems approach (full life-cycle costs).
- Increase efficiencies in energy supply, conversion, and utilization through financial and regulatory assistance and incentives.
- Promote flexibility in the energy sector.

SUCCESS INDICATORS

- Increased penetration of alternative transportation fuels by the year 2010.
- Reduction of oil use per dollar of U.S. Gross Domestic Product.
- Increased penetration of natural gas.
- Maintenance of all energy options to ensure flexibility.
- Increased level of fuel-switching capabilities among energy fuels.
- Adequate emergency planning and liquid fuel reserves to mitigate severe impacts of oil price and supply disruptions.

GOAL 3

Reduce adverse environmental impacts associated with energy production, delivery, and use.

STRATEGIES

- Reduce energy-related emissions of greenhouse gases below 1990 levels by the year 2000 through development and deployment of efficiency-enhancing and alternate-energy technologies and processes and through continued operation of safe, economical nuclear powerplants.
- Reduce regional and local impacts of U.S. energy-related emissions and discharges through the development and deployment of lower emission energy transformation, delivery, and end-use technologies.
- License and operate a repository for the Nation's spent nuclear fuel and other high-level radioactive waste.
- Improve the global environment through policy leadership at home and programs for the export of advanced energy and environmental technologies.

SUCCESS INDICATORS

- Increase in market penetration of energy technologies that reduce greenhouse gases, sulphur dioxide, nitrogen oxides, and other critical pollutants.
- Increase in number of alternative fuel vehicles in use in the commercial transportation sector.

- By 1995, determine a long-term waste repository program funding policy and profile, rebaseline the Yucca Mountain site suitability effort, and, by 1996, define the departmental role regarding nuclear spent fuel interim storage at reactor sites and in the Federal waste management system.
- Increase in percentage of U.S. market share in the export of clean energy technologies.

GOAL 4

Promote economic and regional equity for all Americans through changes in the systems of energy production, delivery, and end-use.

STRATEGIES

- Develop tax policies and fund programs that ensure universal access to affordable energy services.
- Develop policies that eliminate disproportionate adverse environmental effects of energy systems on geographic regions, minority and low-income groups, and local communities.

SUCCESS INDICATORS

- Increase in percentage of public utility commission decisions giving explicit recognition to equity issues.
- Increase in number of low-income households weatherized.
- Decrease in ratio of energy system costs to benefits, by population groups.
- Increase in equity considerations in the siting of new energy systems.

SCIENCE AND TECHNOLOGY

First-class basic and applied science are needed to advance industrial competitiveness, clean energy resources, national security, and environmental quality through technology leadership. The Administration's technology plan of February 23, 1993, recognizes this by setting a key goal for the Nation of world leadership in science, mathematics, and engineering.

VISION

Science and Technology provide the knowledge that drives our future. World-class scientists and engineers; working in world-class facilities on leading-edge problems will spawn the knowledge that revolutionizes technology—the knowledge and technology that others need to achieve their vision.

GOAL 1

Provide the science and technology core competencies that enable DOE's other businesses to succeed in their missions.

STRATEGIES

- Maintain and validate program excellence and balance in basic science and applied science that supports the energy, environment, national security, and industrial competitiveness missions.
- Fully utilize research facilities, as appropriate, to reduce unit costs.
- Develop innovative options for funding R&D partnerships.
- Build on and nurture appropriate DOE core competencies.
- Encourage flexibility in research programs.

DOE's advanced photon source will provide research opportunities that could lead to higher quality products that last longer. When experiments begin in 1996, it will produce x-ray beams one trillion times more brilliant than conventional x-ray machines. Joint research teams from industrial, university, and government labs will build and operate research facilities at the site.

- Improve communications and establish partnerships among suppliers, customers, and stakeholders.

SUCCESS INDICATORS

- Quality of science, as indicated by favorable outside peer reviews and judgments of expert advisory committees.
- Closer linkage of energy research programs to DOE's energy, national security, and environmental technology programs.
- Maintain or improve the performance and preeminence of the Department's large research facilities, as indicated by the reliable and cost-effective operation and maintenance of world-class research facilities and endorsements from the research users.
- Increase in DOE's influence in developing the information superhighway.

GOAL 2

Provide new insights into the nature of matter and energy, address challenging problems, and create a climate in which breakthroughs occur.

STRATEGIES

- Maintain and validate program excellence and balance in high energy and nuclear physics and other fundamental sciences.
- Ensure a flow of knowledge into society by striking a reasonable balance in support of principal investigators, new facilities, and existing facility operations.

- Partner with universities and the international scientific community to maximize benefits.
- Ensure adequate support for priorities by utilizing management systems that reflect state-of-the-art business practices.
- Earn confidence by making realistic claims and delivering on what is promised.

SUCCESS INDICATORS

- Quality of science and innovativeness of research, as indicated by favorable outside peer review and expert advisory committee reports.
- Sustained achievement in advancing knowledge, as indicated by the impact of knowledge gained in other scientific and technological fields, and the number of publications, citations, and awards generated by DOE-supported research.
- Optimal operation of major experimental facilities, as indicated by operating efficiency and performance benchmarking.
- Development of new technologies that advance fundamental research capabilities and reduce costs, as indicated by new scientific and technology programs that emerge from the research.

GOAL 3

Construct leading-edge experiments and user facilities on schedule, within budget, and in a safe and environmentally responsible manner.

STRATEGIES

- Ensure that all facilities are "best-in-class" by using total quality management benchmark processes and state-of-the-art management information systems.
- Develop an oversight process that involves affected parties in a team approach to facility review.
- Employ risk-based cost benefit analysis to help set priorities and make decisions.
- Involve the international community to develop a global research facility network.
- Use innovative technologies to reduce costs.

SUCCESS INDICATORS

- Preeminence of facilities, as indicated by support by DOE and users, comparison with other facilities worldwide, the nature and extent of university and industrial involvement, and investment by users in the facility.
- Improved performance of facilities, as indicated by meeting original target performance plans and meeting expectations of users.
- Achieving construction cost and schedule milestones, as agreed upon prior to construction.
- Establishment and documentation of methods for determining and ensuring the level of and compliance with environmental, safety, and health standards.

GOAL 4

Add value to the U.S. economy through the application of new and improved technologies.

STRATEGIES

- Strengthen alignment between DOE programs and industry needs. Adequately plan and fund partnerships with industry.
- Streamline and improve the technology transfer process and learn how to work better with small businesses.

- Provide adequate funding for partnerships with industry.
- Provide adequate support for applied research and technology development.
- Forge links with other agencies and academia to leverage research benefits and avoid duplication.
- Strengthen links between laboratories.
- Establish national laboratories as regional centers to stimulate industrial competitiveness.

SUCCESS INDICATORS

- Increase in number and magnitude of cooperative activities with industry.
- Increase in technologies developed and deployed as a result of partnerships with industry.
- Increase in number of new projects at companies and problems solved or avoided that can be attributed to interactions with DOE programs.
- Increased leverage of government dollars with private sector funding.

GOAL 5

Help provide a technically trained and diverse workforce for the Nation and enhance American scientific and technical literacy, especially in energy, the environment, and the impact of science on the economy.

STRATEGIES

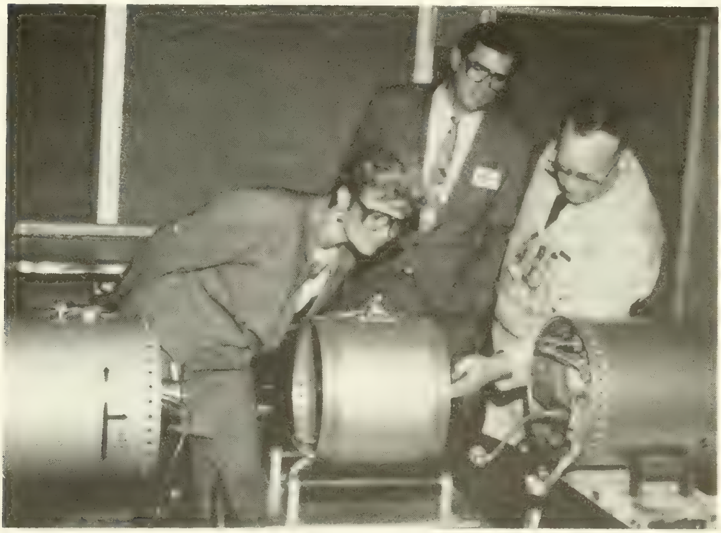
- Increase DOE participation in pre-college mathematics and science and continuing education programs.
- Increase DOE programs for teachers and students in the Department's laboratories.
- Support and encourage greater involvement by DOE science and technology staff in educational and community outreach programs.
- Expand opportunities in science at an early age for traditionally under-represented groups.
- Provide scientific and technical energy information through dissemination mechanisms responsive to customer needs, such as teacher networks, use of electronic networks, public television, and outreach vans and buses.

SUCCESS INDICATORS

- Improved scientific literacy of the American public and workers and increased participation of traditionally under-represented groups in technical education programs.
- Improved technical effectiveness of DOE and contractor employees, as indicated by work performance and community outreach.
- Increases in level of customer demand for departmental information resources and more positive feedback from information users.

NATIONAL SECURITY

For almost fifty years, our national security has relied on the deterrent provided by nuclear weapons. The diminishing strategic military threat, due to the end of the Cold War and break-up of the Soviet Union, has provided the opportunity to redirect priorities from weapons production activities to other critical missions. At the same time, the Nation continues to rely on its nuclear deterrent, including nuclear powered warships, to fulfill critical national security missions. Their continued safe and effective operations are essential to national security.



Reducing the nuclear danger: Secretary O'Leary and U.S. Representative Bill Sarpalius of Texas are briefed by Pantex plant training specialist Jim Dugger during a '93 visit. Pantex plays a role in reducing the nuclear stockpile by safely and securely dismantling nuclear weapons, which contributes to the Administration's nonproliferation efforts.

Reducing the continuing and new nuclear dangers that the world faces, responding with programs that build upon and enhance the strengths of the DOE complex and the national laboratories, and emphasizing commitments to environment, safety, and health, are the essence of the Department's national security strategy.

VISION

Reducing the global nuclear danger. Accomplishing this vision means that by the year 2010:

- There will be fewer nuclear weapons worldwide.
- The stockpile will continue to be safe, secure, and reliable—without underground nuclear testing.
- Nuclear weapons-capable materials will be safe, secure, and headed for final disposition worldwide.
- The Department's national security infrastructure will continue to be a full participant in U.S. nonproliferation efforts.
- The DOE national security enterprise will be small, cost-effective, flexible, and environmentally sound.
- The Naval Reactors program will continue with, and enhance, the policies and practices that have achieved a worldwide reputation for excellence and safety.

GOAL 1

Assure that DOE remains a full participant in preventing the spread of nuclear weapons, materials, and expertise, and the preeminent agency in providing the technology to do this.

STRATEGIES

- Maintain national recognition of DOE as the preeminent research and development organization.
- Determine customer requirements.
- Maintain close coordination with other policy and research and development organizations addressing nonproliferation and arms control challenges.

SUCCESS INDICATORS

- Increase in frequency with which customers call DOE for support in arms control and nonproliferation efforts.
- Increase in number and quality of research and development initiatives completed/applied and decrease in time from concept to application.
- Increase in percentage of research and development efforts for which there are specific applications and customers.

GOAL 2

Maintain nuclear weapons technology and competence that are responsive to national security needs—within expected fiscal constraints.

STRATEGIES

- Continue maintenance and retrofit capability for the current stockpile.
- Enhance the surveillance program.
- Develop and implement a stockpile stewardship program to assure confidence that the stockpile remains safe, secure, and reliable—without underground nuclear testing.

SUCCESS INDICATORS

- Meeting schedules for stockpile surveillance evaluations, regular maintenance requirements, and experiments to assess reliability and safety of the stockpile.
- Improvement in time required to respond to unanticipated stockpile problems.
- Time required to return to testing, if directed, is acceptable.
- Compliance with environmental, safety, security, and health requirements.
- Meeting design, construction, and operations schedules for the facilities in the stockpile stewardship program.
- Success of computer codes to evaluate experimental results.
- Ability to match past tests with experiments in new facilities.

GOAL 3

Reduce the worldwide nuclear stockpile by safely and securely dismantling thousands of nuclear weapons. Support safe, environmentally sound control and disposition of nuclear materials and components that could contribute to proliferation by providing capabilities, technologies, and systems.

STRATEGIES

- Develop and implement an approach for processing and storage of materials returned from the stockpile.
- Implement "transparency" through measures that include international inspections and bilateral agreements providing for the confirmation of declared inventories of materials returned from weapons stockpiles and

the methods for their storage, processing, and disposition.

- Work within U.S. Government, with other countries, and with stakeholders to plan and implement prioritized, continuous improvements for environment, safety, and health, security, and cost-effectiveness of dismantlement and disposition operations.

SUCCESS INDICATORS

- Degree to which DOE's capacity for dismantlement meets requirements.
- Quantity of excess weapons fissile materials that is accounted for and/or subject to international verification.
- Decrease in number of environmental, safety, health, and security-related incidents associated with dismantlement.

GOAL 4

Achieve continual enhancement of the technology infrastructure and core competencies for execution of the national security mission while further assisting industrial competitiveness.

STRATEGIES

- Develop and implement a process to assess the adequacy of the science and technology base for national security and industrial competitiveness.
- Work with customers to determine their requirements, interests, and conditions for long-term support.

SUCCESS INDICATORS

- Quality of the program, as measured by review groups.
- Increase in citations and R&D awards.
- Increase in number of proposals for partnerships and extent of reduction in processing time.
- Increase in overlap of technology infrastructure with industrial competitiveness requirements.

GOAL 5

Transform the DOE national security infrastructure to meet all current and future requirements for 1) management of nuclear weapons design, testing, and manufacturing technology, 2) safe, secure disposition of weapons capable materials, and 3) maintenance of arms control and related technologies. Make the infrastructure cost-effective, responsive, flexible, agile, and environmentally responsible.

STRATEGIES

- Use the programmatic environmental impact statement re-scoping process to define the scope of restructuring and assure integration of issues.
- Address local concerns about employment losses by promptly developing each site's programs for defense conversion/worker retraining.
- Integrate and revitalize the stockpile stewardship and technology infrastructure program to minimize technical risk and assure that national security capabilities remain "second to none."

SUCCESS INDICATORS

- A complex that is smaller, less diverse, more cost effective, secure, and environmentally responsible.
- Meeting the percentage of equipment relocated, facilities modified, construction completed, or processes qualified at receiver sites against the plan for nonnuclear consolidation.
- Office of Management and Budget and Congressional support for budget requests and outyear funding requirements needed to complete the approved plan are provided.

ENVIRONMENTAL QUALITY

The principal environmental quality objective—and the greatest challenge—of the Department of Energy is to eliminate the risks and imminent threats posed by past departmental activities and decisions. With the end of the Cold War, we have turned our focus to understanding and eliminating the enormous environmental problems created by the Department's historical mission of nuclear weapons production.

While we are just beginning to understand the scope and cost of the environmental degradation, the Department affirms the great need to eliminate risks and imminent threats to human health and the environment. We also affirm the need to minimize and prevent the pollution from on-going departmental activities.

VISION

The environmental quality vision is:

- There will be full incorporation of improved environmental quality considerations in DOE's daily operations and decisions to ensure no further degradation.
- The environmental, safety, and health risks at all DOE facilities will be well understood.
- DOE will manage, control, and/or return as much land as possible to alternative uses and ownership.
- DOE will be a world leader in environmental technology development and application.

Environmental Quality: workers at training sessions are taught to perform a radiological survey for contamination.

- DOE will promote the use of cleaner energy and production processes.

GOAL 1

Reduce uncertainties, prioritize risks, and eliminate threats of our activities to improve environmental quality.

STRATEGIES

- Characterize and assess all risks and threats to environment, safety, and health.
- Strengthen enforcement of environmental, safety, and health performance.
- Ensure releases are below regulatory limits and implement aggressive waste minimization and pollution prevention activities.
- Promote independently enforced, risk and health-based standards.

SUCCESS INDICATORS

- Releases are below regulatory limits and departmental requirements.
- Increased percentage of departmental land and facilities turned over for appropriate alternative use.
- Environmental, safety, and health performance at departmental facilities is better than that of private industry.
- All risks/threats are assessed and characterized.
- Enforcement of agreed-upon risk and health-based standards. ("How clean is clean?")
- Environmental enhancement opportunities are assessed and prioritized.

GOAL 2

By the year 2000, attain credibility and public trust and demonstrate openness.

STRATEGIES

- Improve overall access to information on departmental activities.
- Expedite Freedom of Information Act requests.
- Plan and encourage advisory boards for major DOE sites.

SUCCESS INDICATORS

- Increase in number of declassified documents.
- Decrease in number of new classified documents.
- More timely processing of Freedom of Information Act requests.
- Decrease in number and dollar amount of environmental fines and lawsuits.

GOAL 3

By 1996, be in control managerially and financially of environmental activities, and be demonstrably perceived as such by our stakeholders.

STRATEGIES

- Improve contract management and reduce costs through establishment of clear performance objectives and penalties.
- Increase the number of projects with fully defined scopes, schedules, and cost baselines.

SUCCESS INDICATORS

- Decrease in average life-cycle cost of contracts.
- Decrease in required rework of products.
- Increase in number of projects with fully defined scope, schedule, and cost baselines.

- Attainment of cost savings and productivity improvement in environmental quality activities.
- Increase in stakeholder satisfaction, based on opinion surveys.

GOAL 4

Achieve independent and credible regulation of departmental activities and facilities and eliminate conflicting requirements.

STRATEGIES

- Promote legislative actions to increase independent and cost-effective regulation of DOE activities.
- Participate in and strengthen interagency efforts to evaluate existing and proposed statutes (including the Atomic Energy Act) and work with Congress and the Executive Branch to implement legislative modification or requirements.
- Review existing internal directions, DOE Orders, tasking memoranda, and other mechanisms to eliminate overlap.

SUCCESS INDICATORS

- Established interagency task force drafts and submits legislation and works with Congress to secure enactment.
- Value-added external regulation is accomplished by the implementation of a systematic approach for transfer of responsibility for worker safety and health to the Occupational, Safety, and Health Administration.
- Measures associated with reducing conflicting regulations and internally generated mandates are identified and systematic implementation is initiated.
- Full compliance with environmental, safety, and health standards.

GOAL 5

By the year 2005, be a leading Federal agency in environmental technology development focused on the Nation's needs.

STRATEGIES

- Develop an integrated systems approach for environmental technology development.
- Establish an environmental technology coordination mechanism within the Department.
- Ensure that the United States becomes the major world supplier of environmental technology applications.

SUCCESS INDICATORS

- Increase in number of advanced environmental technologies used by Federal agencies.
- Increase in commercialization of advanced technologies.

THE CRITICAL SUCCESS FACTOR STRATEGIES

The previous strategies have described what the Department's five businesses are going to accomplish. The following sections describe the strategies for how the Department will conduct its operations.

COMMUNICATION AND TRUST

The Department of Energy has a unique responsibility to establish a relationship with the American people based on communication and trust. As the Federal agency entrusted with the Nation's nuclear weapons complex and resulting radioactive and hazardous wastes, the Department must deal honestly and fairly with the public it serves, to increase knowledge about its mission and activities, and reduce unwarranted fears. Habits that encourage communication and trust must become part of the agency's daily decision-making processes.

VISION

Trust in DOE's role in contributing to the U.S. science and technology base and energy policy, and in reducing the nuclear danger, results from open and honest communication of responsible action.

GOAL 1

The Department's vision, mission, performance, and contributions to science, technology, and national competitiveness in the global marketplace are recognized and valued.

STRATEGIES

- Ensure every communication reinforces DOE's identity.
- Develop a graphic device to identify DOE products.
- Produce a brief, clear, candid Annual Accomplishments Report, reflecting both successes and inadequacies, assessing and widely disseminating the degree to which DOE has fulfilled its vision.
- Develop a proactive Speakers' Bureau to provide speakers to community organizations and talk shows around the Nation.

SUCCESS INDICATORS

- Regular surveys show increase in customer and public awareness of DOE and its missions.
- The ratio of positive-to-negative media stories increases.

GOAL 2

DOE is trusted and trusting both internally and externally.

STRATEGIES

- Live up to our core values and vision ("walk our talk").
- Take customer feedback seriously.
- Use "validators" with public credibility (e.g., National Academy of Sciences, professional/technical societies, and respected public interest groups) to review DOE decisions.

- Use innovative partnerships to enhance public understanding and to accomplish DOE's mission.
- Make public access to information and facilities easier (establish a policy of openness).

SUCCESS INDICATORS

- Commitments are met.
- Customer survey results are applied to program planning initiatives and budgets.
- Partnerships are established and information is shared with other Federal agencies, State and local governments, Native American Nations, industry, public interest organizations, and academic institutions.
- Much national security information is declassified and future classification is minimized.

GOAL 3

DOE communications (both internal and external) are timely and of high quality.

STRATEGIES

- Identify end use and goals of all communications products and create quality products to meet those goals.
- Understand customers, and determine and respond to their communication needs.
- Institutionalize training in communication and customer service skills.
- Minimize public's need to invoke the Freedom of Information Act to obtain information.

SUCCESS INDICATORS

- User-friendly public inquiry system is developed (1-800 number).
- Overall customer satisfaction (internal and external) with transactions with members of the DOE family is high.
- "One-stop" public access system for obtaining DOE reports and documents is established.
- Ineffective products are eliminated and communication plan is adopted to ensure the need for and responsiveness of future products.

GOAL 4

DOE listens and responds to its customers and partners in a fair and open process that encourages participation.

STRATEGIES

- Conduct public participation in good faith.
- Make participation with public and use of customer feedback a routine and valued practice.
- Ensure that all DOE officials designated as liaisons to customers act not only as communicators (or defenders) of DOE policy, but as conduits and advocates of customer reactions.
- Establish "Secretary's Annual Excellence in Public Involvement Award" to be given to organizations that creatively and effectively implement public involvement initiatives.

SUCCESS INDICATORS

- Officials who deal directly with the public are empowered to make commitments and explain why decisions are made.
- Increase in percentage of customer suggestions that become DOE policy.
- Decrease in number of lawsuits filed by unsatisfied customers.

- First "Secretary's Annual Excellence in Public Involvement Award" is presented in 1994.

GOAL 5

All members of the DOE family serve the communication needs of their internal and external customers knowledgeably and responsibly.

STRATEGIES

- Take full advantage of new technology to provide quality communications internally and externally by 1999.
- Develop a plan to take advantage of current technology—computer, optical, document management, telecommunications—to improve communications, internally and externally.
- Develop a real-time reference base of information—e.g., speech information, visual aids—that can be readily accessed by all members of the DOE family.
- Develop a technical data base accessible by external and internal customers that addresses budgets, contracts, grants, environmental, safety, and health programs, waste management and defense activities, energy technologies, science, and energy-related consumer information.

SUCCESS INDICATORS

- Technology implementation plans are incorporated in planning and budget decisions.
- DOE-wide electronic mail systems are integrated so all personnel can communicate easily.
- Data base system is automated and accessible by DOE family and external customers.
- High percentage of inquiries and investigations is satisfied by output from data bases.

GOAL 6

All members of the DOE family see themselves as part of a community of service sharing a common vision and applying core values.

STRATEGIES

- Communicate short, clear, focused statements of DOE mission and vision to DOE family.
- Modify the recognition system to reward teamwork.
- Train all employees in communications, team building skills, listening skills, and the Department's core values.
- Provide flexibility in the work schedule for participation in professional and community organizations.

SUCCESS INDICATORS

- Improvement in morale and pride in the Department, as measured by increased productivity and number of successfully adopted suggestions.
- Continuous quality improvement processes are established and evaluated regularly.

HUMAN RESOURCES

People are our most important resource. The more successful our people are, the more successful the organization can be. Our human resources future will determine the Department's future.

VISION

We are an energized team of creative and dedicated people achieving departmental excellence.

GOAL 1

Align human resources with departmental priorities and requirements.

STRATEGIES

- Assure there is a common understanding of the Department's priorities and requirements.
- Allocate human resources consistent with the Department's priorities and requirements.
- Provide incentives and support for doing more with less.

SUCCESS INDICATORS

- Agreement is reached within the Department regarding workforce planning and analysis strategy.
- Skills bank is established.
- Target number of employees retrained/reassigned is reached.

People are our most important resource.

GOAL 2

Ensure a diverse and talented workforce.

STRATEGIES

- Achieve the benefits afforded by a diverse and talented workforce through strengthened management commitment and accountability.

SUCCESS INDICATORS

- Increase in percentage of minorities, women, and persons with disabilities in the workforce and in management positions.
- Enhanced training is established for managers and supervisors.
- Increased participation in programs such as upward mobility.

GOAL 3

Develop and maintain a well trained and versatile workforce.

STRATEGIES

- Institutionalize strategic planning for training and development.
- Establish an integrated career partnership system.
- Develop and implement a management training curriculum.
- Develop and implement a departmental technical intern program.

SUCCESS INDICATORS

- Increase in number of career tracks and mentoring relationships established.
- Strategic planning process for training and development is established.
- Increase in number of individual development plans.

GOAL 4

Ensure a highly motivated workforce.

STRATEGIES

- Reduce human resources regulations and practices for optimum flexibility.
- Foster and institutionalize the core values of the Department.

SUCCESS INDICATORS

- Streamlined human resources processes.
- Improved morale as measured by employee surveys.

- Simplified performance appraisal system and an equitable awards program implemented.

GOAL 5

Use quality management principles in all aspects of the way we do business.

STRATEGIES

- Build and institutionalize a total quality management infrastructure.
- Focus on internal and external customer satisfaction.
- Identify and continuously improve human resources processes.

SUCCESS INDICATORS

- Increase in number of organizations engaged in total quality management implementation.
- Increase in number of employees involved in process improvement teams.
- Decrease in number of internal/external customer complaints.

ENVIRONMENT, SAFETY, AND HEALTH

Ensuring the safety and health of workers and the public and the protection and restoration of the environment are fundamental responsibilities of the Department of Energy. Excellence in environmental, safety, and health activities and timely implementation are critical to the success of each of the Department's businesses. It is the foundation of the Department's largest program, environmental management.

VISION

The hallmark and highest priority of all our activities is daily excellence in the protection of the worker, the public, and the environment. Fundamental to the attainment of this vision are personal commitment, mutual trust, open communications, continuous improvement, and full involvement of all interested parties.

GOAL 1

Empower workers and take other necessary actions to prevent all serious injuries and all fatalities, and to eliminate all worker exposures and environmental releases in excess of established limits. By eliminating these exposures and releases, reduce the incidence of illness among workers and the public, and prevent damage to the environment.

We respect the environment.

STRATEGIES

- Establish effective employee complaint and employee suggestion processes, and establish labor/management safety and health committees to cover all workers at all sites.
- Train individuals to appropriate and established levels of job competency and proficiency.
- Establish a consistent and effective approach to adequately resolve common DOE-wide safety and health problems.
- Modify prime contractors' contracts to strengthen accountability for safety and health, including performance of all subcontractors in these areas.
- Establish an effective medical surveillance program at all sites and

Acid rain research: college intern measures rates of leaf photosynthesis with a field portable gas analyzer system at DOE national lab. Measurements have been important indicators of pollutant effects on plant growth.

utilize it to improve conduct of operations and worker health and safety.

- Develop DOE-wide definitions for serious injury/illness and other appropriate health indicators, and develop information management systems for health outcome data.
- Implement a safety analysis system for all new technologies, including system-specific Standard Operating Procedures, training prior to start-up of new technologies, and clearly defined roles and responsibilities within DOE.

SUCCESS INDICATORS

- All worker safety and health complaints are acknowledged within 48 hours and resolved in a timely fashion.
- Number of complaints rises over the first year and declines thereafter.
- Decrease in number of fatalities, serious injuries, incidents of illness, and exposures and releases (in excess of established limits).

GOAL 2

Ensure there are specific environmental, safety, and health performance requirements for DOE activities which are the basis for measuring progress toward continuous improvement.

STRATEGIES

- With stakeholder input, develop and apportion performance elements and benchmark DOE's performance against other government agencies and the private sector that have comparable activities.
- Establish a focus group to define accountability and ownership of the performance indicators and implement recommendations of the focus group.
- Develop a system to achieve consistent management tracking of environmental, safety, and health issues and performance.
- Develop a process to systematically define health/risk-based standards and requirements.

SUCCESS INDICATORS

- Performance elements are in place and measured.
- All performance indicators have owners who are accountable.
- Number of health/risk-based standards increases over time.
- Volume of facility effluents decreases over time.

GOAL 3

Establish clear environmental, safety, and health priorities and manage all activities in proactive ways that effectively and significantly increase protection to the environment and to public and worker safety and health.

STRATEGIES

- Establish a sound departmental approach to environmental, safety, and health priority setting, and define clear and accountable indicators to gauge success in satisfying established priorities.
- Revise DOE budget processes to account for environmental, safety, and health expenditures and priorities, require justification of needs, and provide the framework for incorporating environmental, safety, and health planning into all phases of the budget cycle.

SUCCESS INDICATORS

- Environmental, safety, and health "high priority" needs are funded.
- Decrease in proportion of unplanned (reactive) versus planned expenditures in budget cycle.
- Decrease in time to complete National Environmental Policy Act actions.

GOAL 4

Demonstrate respectable performance related to environmental protection and worker/public safety and health. Ensure related DOE information is reliable, comprehensive, and available through an open process. As a result, earn public credibility.

STRATEGIES

- Commit to seek independent and credible external regulation as soon as possible, and establish working groups (including interagency) to plan for the transition and implementation.
- Declassify as many documents as possible, and seek resources to improve information access and dissemination, including reduced response time for information requests. Involve local and State governments in information dissemination/reliability processes.
- Participate and provide leadership in Administration efforts to address issues related to human experimentation conducted by governmental agencies.
- Improve reliability of information through willingness to provide raw data and to seek outside expert review.
- Conduct stakeholder meetings and operate in as open an environment as possible. Seek customer input in decision-making processes and provide feedback.
- Educate the public, media, and the Congress on DOE's environmental, safety, and health issues and progress.

SUCCESS INDICATORS

- DOE credibility improves in the polls and good press increases.
- Increase in ratio of external to internal oversight.
- Increase in level of stakeholder involvement and two-way feedback.
- Increase of available unclassified data.
- Decrease in number of Freedom of Information Act requests and Department's response time for current information.

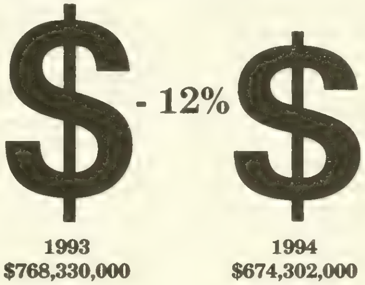
MANAGEMENT PRACTICES

The Department has an urgent need to embrace the best management practices to improve processes and customer satisfaction, prevent defects, and eliminate waste. It has an $18 billion budget, over 20,000 employees, and a large number of research laboratories, facilities, and Operations Offices. It oversees large-scale special operations such as the processing and storage of nuclear materials and the production of power for large regions of the country. It is one of the largest owners of public facilities in the world. Still, it contracts out about 85 percent of its work by dollar amount.

The Department will be viewed as "best in class."

The management of such an operation must have a coherent and well structured architecture so that it may more effectively

Changes in Dollars Spent on Support Service Contracts from 1993 - 1994



Secretary O'Leary presented her contract reform report on February 3, designed to make contractors more accountable for performance, increase competition for DOE business, and tighten cost controls.

meet the requirements of its customers and its national and international responsibilities.

VISION

The Department will be viewed as "best in class" in its management practices. Customer expectations of its management practices will be met or exceeded. People will be empowered through integrated and open management systems that are results-oriented and cost-effective.

GOAL 1

Ensure management practices meet or exceed customer expectations.

STRATEGIES

- Determine customer requirements with customer participation.
- Reconcile customer requirements with statutory requirements and resource limits.

SUCCESS INDICATORS

- Increases in customer/stakeholder satisfaction levels.

GOAL 2

Ensure management practices are driven by, and supportive of, mission needs.

STRATEGIES

- Define management practice owners and practices to be improved.
- Clarify roles and responsibilities for decision-making.

SUCCESS INDICATORS

- Meeting action plan schedules.
- Increase in number of decision levels, regulations, and processes eliminated.
- Increase in number of systems improvements implemented.
- Contract dollars saved.

GOAL 3

Ensure management practices mirror our best public and private sector counterparts.

STRATEGIES

- Use total quality management and DOE-wide benchmarking to reengineer and integrate management practices for continuous improvement.
- Implement a comprehensive training/education program.
- Use award criteria as guidelines for continuous improvements.

SUCCESS INDICATORS

- Increase in effectiveness, as measured by timeliness, accuracy, and costs.
- Decrease in time required to implement changes.
- Increase in number of employees trained in management practices.
- Improvements in management controls (e.g., by Federal Manager's Financial Integrity Act Reports and General Accounting Office/Inspector General Audits).

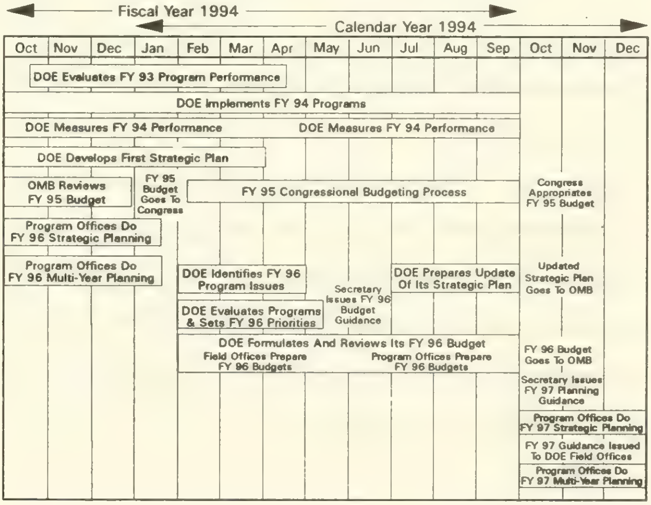
UPDATING THE STRATEGIC PLAN

This document represents DOE's long-range strategy. The specific details of how the Department will achieve its goals and objectives are described in the strategic plans, multi-year program plans, operational plans, and budgets prepared by the program offices and laboratories. Success will be measured against performance indicators, some of which have already been presented.

A calendar of the Department's key planning and budgeting efforts and their relationship with the Office of Management and Budget and Congressional budget processes are shown below. During any given year, the Department is addressing planning, budgeting, and program evaluation activities that span four separate fiscal years.

This strategic plan represents work in progress. The future will be different than we picture it today, with new technologies, new laws, new barriers, and new opportunities. It is essential that we anticipate and accommodate such change. Strategic planning is therefore a continuous process; our plan will be reviewed at least annually and revised as appropriate. An updated plan will be provided to the Congress each year along with the President's annual budget submission.

Schedule for Strategic Planning and Budgeting



Questions from Representative Rohrabacher

Question 2: On page 1 of your prepared testimony, you state: " In addition, we sharpened the strategic focus and priorities for our core missions in energy, national security, environment, and fundamental science, and we resolved that the impact of these missions on industrial competitiveness was a critical success factor."

Please detail how "the strategic focus and priorities for our core missions in energy, national security, environment, and fundamental science" were "sharpened".

Answer: One of my first initiatives after being confirmed as the Secretary of Energy was to develop the Department's strategic planning process. This effort involved the entire leadership of the Department, including the directors of the National Laboratories. It was the first time that the Department, like a corporation, evaluated both the nature of the business we are responsible for and its relative priorities. By collectively assessing the Department's missions, deliverables, and customers, we were able to develop a more comprehensive, customer-focused, and strategic view of our initiatives. This private sector approach had never been tried in the Department of Energy.

For six months in 1993, the Department's senior managers conducted a comprehensive strategic review of the Department's businesses that included the employees of the Department, our contractors, and, more importantly, those who have a stake in our success and the customers we serve. As a result of this process, mission statements, goals, and strategies were developed for each of the Department's core business lines.

Briefly, the highlights of each of our core missions, as determined by this review, are:

Energy Resources: Encourage efficiency and advance alternative and renewable energy technologies, increase energy choices for all consumers, assure adequate supplies of clean, conventional energy, and reduce U.S. vulnerability to external events.

Science and Technology: Use the unique resources of the Department's laboratories and the country's universities to maintain leadership in basic research, increasingly focus applied research in support of the Department's other business lines, and maintain world technical leadership through long-term, systemic reform of science and mathematics education.

National Security: Effectively support and maintain a safe, secure, and reliable enduring stockpile without nuclear testing, safely dismantle and dispose of excess weapons, and provide the technical leadership for national and global non-proliferation activities.

Environmental Quality: Understand and reduce the environmental, safety, and health risks and threats from DOE facilities and decisions; and develop the technologies and institutions required for solving domestic and global environmental problems.

The Department's Strategic Plan and the process that led to its creation have been a blueprint for unprecedented change at the Department. Our commitments to tangible, measurable results and openness have resulted in a Department that is more trusted and credible than when we started, and more focused on high-level priorities.

Questions from Representative Rohrabacher

Question 3: On page 2 of your prepared testimony, you state: "the Department is committed to saving $2.8 billion from efficiency improvements and cuts to lower priority programs over five years through Strategic Alignment."

Please provide the analytical basis for the $2.8 billion figure.

Answer: As a direct outgrowth of the Department's strategic planning process, it became clear that we were not organized in the most efficient manner to realize our strategic goals and objectives. As we instituted a new budget process that linked budgets to strategic priorities, it also became clear that we had to do a better job of tying our resource commitments to those activities that provide the biggest payoff to the American people. From the beginning, we have been implementing management reforms that have resulted in tremendous savings to help us manage the growing body of work expected of the Department of Energy. As a result of the experience of the past two years with management reforms, I committed to the President to the savings you mentioned. Exactly how and where these savings will come from are directly related to two initiatives.

The employee-led Strategic Alignment initiative took a fresh and unconstrained look at the way the Department is organized and the manner in which business is conducted with an eye toward better aligning the Department with the Strategic Plan and ensuring the most efficient delivery of our services. This, coupled with the Department's implementation of recommendations of the Task Force on Alternative Futures for the DOE National Laboratories, led by Bob

Galvin, form the basis for the $2.8 billion reduction phased in over five years.

The Strategic Alignment plan was completed on May 3, 1995.

DOE NEWS

NEWS MEDIA CONTACTS:
Press Office, 202-586-5806

FOR IMMEDIATE RELEASE:
May 3, 1995

DOE Alignment Delivers $1.7 Billion to Taxpayers

Includes Office Closings, Employee Reductions, Privatization, Asset Sales

Energy Secretary Hazel R. O'Leary today announced a Strategic Alignment and Downsizing Initiative that will yield $1.7 billion toward deficit reduction. The Alignment and Downsizing package includes closing 24 offices, reducing federal employees by 3,788 (27 percent), and cutting expenditures in a variety of other areas. Secretary O'Leary also submitted legislation today that would privatize three Power Marketing Administrations and the Naval Petroleum and Oil Shale Reserves. By the end of May, she will submit legislation to transform the Bonneville Power Marketing Administration into a government-owned corporation and remove the Federal Energy Regulatory Commission (FERC) from the Department. Enactment of the legislative package would generate an additional $5.3 billion.

"Today, we take an historic step in restructuring the Department of Energy for its vital post-Cold War missions. Our downsizing and alignment commitments will enable us to do our work better and at lower cost," said Secretary O'Leary. "Our legislative package puts the ball squarely in Congress' court. With their cooperation, we can deliver $5.3 billion more of our $14.1 billion commitment made to President Clinton and American taxpayers in December."

President Bill Clinton said, "For two years, the Department of Energy has been in the forefront of our Administration's effort to improve service to the American people, reduce costs and open government to the public. Now, the Department and Secretary O'Leary are building on that outstanding record by cutting the size of government and bringing government closer to the people we serve."

(MORE)

R-95-064

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Employees Reduced and Offices Closed in Washington, D.C. and Nationwide
By merging programs, creating "matrix" management structures, moving work to the field and cutting unnecessary work, DOE will reduce employment in headquarters by 2,338 (34 percent) from a 1995 level. This workforce reduction as well as consolidations and mergers will enable the Department to close 12 of 16 offices in the Washington, D.C. area by 1999.

Field office staff will be reduced by 1,450 (21 percent) from a 1995 level of 7,050. Approximately 800 of these reductions will be completed in 1997. In addition, 11 field offices and one international office will be closed. Affected offices include:

- Four energy efficiency support offices in San Francisco, CA; New York, NY; Kansas City, MO; and Dallas, TX. In addition, the Denver, CO Energy Efficiency support office will be closed and consolidated into the Golden, CO operations office.

- Four fossil energy offices will be closed: Metairie, LA and Laramie, WY offices will close; Bakersfield, CA and Casper, WY offices will be closed with privatization of the Naval Petroleum Reserve.

- Additional offices closing include: Houston and Dallas, TX offices supporting the Office of the General Counsel; and an energy policy office in Paris, France.

Through initiatives announced earlier, contractor workforces are being downsized by 19,000 people or 13 percent through the end of FY1996.

Block Grants Introduced to States
DOE will consolidate four energy grants into "performance partnership" block grants to States. This approach makes applications easier to submit and allows DOE to consolidate grant administration and technology transfer activities and reduce the number of regional support offices from 10 to five. Services will continue to be provided to customers in the areas where offices have closed through "virtual office" operations. These changes will save $68 million over five years.

$75 Million Through Asset Sales
DOE's Cold War mission left the Department with a stockpile of assets in excess of our currently anticipated needs. Assets include more than 10,000 pounds of precious metals (e.g., gold, silver, platinum), more than five tons of other metals and thousands of tons of chemicals. The Department will sell surplus assets to generate at least $75 million in receipts and reduced overhead costs associated with storage, security and handling.

(MORE)

Travel, Information Management and Reduced Contractor Support Totals $835 Million
The Secretary announced travel cuts of $175 million over five years to be realized through better travel decisionmaking, greater use of videoconferencing and leveraging Government buying power on behalf of contractors. DOE spends $365 million annually in travel for Federal and contractor employees. Improved information management systems will generate another $200 million over five years.

In addition, DOE will reduce use of support service contractors for activities such as technical analysis, communications and administrative functions. Cuts in these contracts will total $460 million over five years.

Regulatory Reform Yields $20 Million, Speeds Process
DOE has identified ways to speed compliance, streamline approvals, reform contracting processes and reduce costs for activities related to the National Environmental Policy Act (NEPA). NEPA documentation is required to assess environmental impacts of DOE initiatives. DOE actions will yield $20 million in savings. More important, the public will have access to environmental impact information in half the time, as we reduce the timeline for Environmental Impact Statements from an average of 33 months to 15 months.

Legislation to be Submitted
Consistent with the President's FY1996 budget proposal, the Administration is submitting legislation to Congress that would:

- Privatize the Western Area, Southwestern and Southeastern Power Administrations and transfer them to local utility customers, generating $3.7 billion in receipts upon implementation

- Establish the Bonneville Power Administration as an independent, government-owned corporation

- Sell the Naval Petroleum Reserves to the private sector, generating $1.6 billion in receipts upon implementation

- Separate the Federal Energy Regulatory Commission from DOE.

The package of legislation would take more than 6,700 employees and 80 offices off the DOE rolls, although many individuals will remain in Federal employment.

Implementation Team Appointed
The Secretary appointed a team to manage implementation of Alignment and Downsizing; they include DOE leadership, Strategic Alignment team members and career employees.

(MORE)

"We know DOE can operate more efficiently. We also know how difficult change can be. Our implementation team will ensure quick progress and that workforce reductions are handled with sensitivity. Reductions In Force will be our last choice," assured Secretary O'Leary.

The Strategic Alignment Team was made up of DOE employees, guided by Deputy Secretary Bill White and internal and external steering committees. The group was assigned to review the DOE system and apply private-sector reengineering methodologies to their analysis and recommendations.

-DOE-

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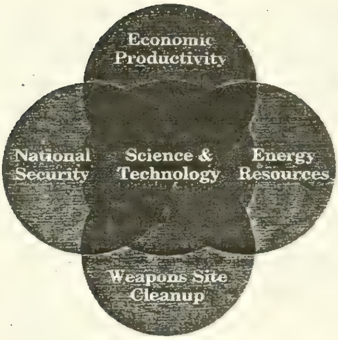

Saving Dollars and Making Sense

Strategic Alignment and Downsizing

United States
Department of Energy
May 1995

Message from the Secretary

In early 1993, President Clinton and Vice President Gore challenged all federal agencies to help create a government that works better and costs less. At the Department of Energy we have met that challenge through an intense period of fundamental rethinking about how we conduct our work. Through a deliberate and phased strategy, we've begun a major organizational transformation that already has saved money and enhanced Government performance--two defining commitments of this Administration. Working together--

- *We created the Department's first-ever Strategic Plan, which provides a framework and shared vision for our missions in National Security, Energy Resources, Weapons Site Cleanup, and Science and Technology.*

- *We initiated a major overhaul of the Department's contracting practices, which will yield billions of dollars in savings through increased competition and performance-based contract management.*

- *We commissioned the first independent post-Cold War review of the Department's ten National Laboratories, and now are aggressively implementing recommendations that will reduce the cost of doing business at the labs and help sustain their long record of scientific discovery and technological innovation--essential for long-term economic growth.*

- *We launched ambitious reviews of our $2 billion applied energy R&D program and our complex system of regulating nuclear safety at our facilities. These two reviews are marshaling some of the most seasoned experts in the Nation to assist us in enhancing the productivity, efficiency, and cost performance of the Department.*

Finally, in the fall of 1994 we announced our Strategic Alignment Initiative--Phase II of our strategic planning process. This 120-day, employee-driven effort was given the job of identifying better, more cost-effective means of performing the core missions defined in our strategic plan.

The package of initiatives announced in this report includes many of the most compelling ideas developed by the Strategic Alignment team. It also includes several initiatives developed separately within the Department. The result is a major package of organizational reforms, legislative proposals, and cost-cutting measures that will contribute more than $1.7 billion in savings toward our commitment, announced in December 1994, to reduce the Department's budget by $14.1 billion over five years. Legislation we are submitting this month would produce an additional $5.3 billion in deficit reductions. The balance of our commitment--involving reductions of $4.4 billion from Environmental Management, $1.2 billion from applied energy programs, and up to $1.4 billion from the Department's laboratory complex--are being addressed through separate efforts.

Through the actions in this report, we have made tough decisions about how we perform our work in a fashion that reduces the size and cost of the Department. This alignment is a bold action plan to reduce layers of management, eliminate organizational redundancies, and integrate activities that historically have operated in isolation. In so doing, we will meet our most important objective, which is to better serve our customers as we deliver on our missions: protecting national security and reducing nuclear danger, enhancing our long-term energy security, advancing the frontiers of scientific understanding, protecting the environment, and developing technologies that contribute to U.S. economic productivity.

These are the missions which drive the Department of Energy's existence. These are not missions from which the Nation can, or should, walk away. While some have discussed dismantling the Department--and possibly even terminating further public support for our missions--we have responded with a clear and consistent message: We have a better way. That better way is to perform these vital missions at dramatically reduced cost, while increasing our level of service to the American public. We will achieve these goals through the continued pride, commitment, and excellence of our workforce.

Hazel R. O'Leary

Hazel R. O'Leary
Secretary of Energy

DELIVERING ON OUR MISSIONS

The Department of Energy is vested with public missions that fundamentally affect the security, prosperity, and quality of life of this and future generations. The commitments reviewed in this report are designed to improve our ability to deliver our missions, which include--

Protecting National Security and Reducing the Nuclear Danger: The Department's weapons laboratories are the Nation's repository of knowledge and engineering competence with regard to nuclear weapons. This unique and irreplaceable human resource helped win the Cold War. Our labs and facilities now are being directed to: continue the safe dismantlement of thousands of nuclear weapons in coming years; ensure a safe and reliable nuclear stockpile without testing; guard against nuclear terrorism; and curb the proliferation of weapons of mass destruction. Although we face a historic opportunity to further reduce nuclear stockpiles, nuclear dangers persist due to the availability of large quantities of weapons-grade materials throughout the world. Security against such risks will continue to depend on the technical expertise of the Department of Energy and our laboratories.

Enhancing Our Energy Security: Helping guard against energy supply disruptions and their associated threats to the United States remain fundamental priorities for the Department. The reasons why are clear: By the year 2010, the U.S. trade deficit in oil is projected to double to $100 billion per year; U.S. oil imports will grow to 60 percent of domestic consumption; and Persian Gulf oil producing nations will provide more than 70 percent of the world's oil exports--surpassing their peak of 67 percent in the embargo year of 1974. Continued federal investments in a diverse portfolio of energy supply and efficiency-related R&D helps ensure against future energy crises that could cripple our economy. The Department, in partnership with industry and academia, has pioneered technologies that are resulting in tens of billions of dollars in consumer energy savings each year. Further R&D, aimed at enhancing the production and efficiency of use of conventional fuels and developing alternative energy sources, must be explored as part of a national program to provide secure, reliable, and diverse energy resources for the future.

Environmental Cleanup and Stewardship: The Department handles some of the most challenging and highest-risk environmental problems in the world. Thousands of radioactive and hazardous waste sites at 15 major locations in 13 states require careful and highly sophisticated approaches to cleanup to ensure the protection of public health and safety. However, our Environmental Management program is more than simply cleanup. It also has the responsibility of providing stewardship over 26 tons of plutonium, managing potentially explosive underground radioactive waste tanks, developing new technologies that will drive down future cleanup costs, and decommissioning and stabilizing more than 7,000 buildings. Beyond the environmental management challenges, the Department and our laboratories also play a vital role in developing pollution prevention technologies that will save billions of dollars while reducing waste.

Advancing Frontiers of Science and Technology: The Nation has reaped enormous benefits from investments in science and technology over the past 50 years, yet continued scientific advance--the fuel for technology's engine--will be essential for continued economic prosperity and national security. The Department's National Laboratories provide world-class facilities for exploring uncharted scientific frontiers from the smallest detectable elements of nature to the farthest reaches of the universe. Our R&D programs have contributed to the Nation's knowledge base, and to our capacity for innovative solutions to emerging problems and national needs, and will continue to do so. Research supported by the Department and its predecessor agencies has earned 59 Nobel prizes and countless other distinctions.

The employees of the Department of Energy have a proud legacy of accomplishments. Our programs have expanded human understanding of the world, created new fields of science and technology, generated innovations that created new commercial markets, and, in the case of national security, determined the course of world history. We are committed to further excellence in our mission areas and know that we can implement these missions better and at lower costs through fundamental changes in the way we do business. We are driven by more than simply the imperative of deficit reduction. Our primary motivation for change derives from the fact that--

- *Fundamental processes which govern how the Department operates are cumbersome, inefficient, and drain our employees of energies that could be spent more productively in other ways*. In response, we must re-engineer these processes and eliminate unnecessary steps so that we can sharpen our focus on mission results.

- *Like most bureaucracies, the Department has responded to problems in the past by adding new layers of management and new processes on top of old ones*. In response, we must de-layer the organization, establish flatter organizational structures, and empower our employees to meet and exceed customer needs.

- *Redundancies within the Department and inefficient procedures have persisted from one Administration to the next, without a fundamental rethinking of how to do things better*. In response, we already have seized the initiative to make major changes in the way we operate, and will accelerate these changes through the commitments in this report (several examples are provided in Appendix C.

MOVING FROM OUR ORIGINS TO THE FUTURE

The origins of the Department of Energy help explain the multiple cultures and patterns of operations that govern the organization today, and also provide insight into why we must change and where we should be headed in the future.

The Department's ancestry dates back to World War II's Manhattan Project and the civilian Atomic Energy Commission (AEC), which were responsible for nuclear weapons development and efforts to create peaceful uses of nuclear energy. The 1973 oil embargo prompted Congress the following year to create the Federal Energy Administration (FEA); other considerations led to establishment in the same time period of the Energy Research and Development Administration (ERDA). Together, these agencies received authorities from the abolished AEC, as well as other Government agencies including the Department of the Interior, Department of Commerce, Department of Agriculture, Department of Transportation, Environmental Protection Agency, Department of the Treasury, and the National Science Foundation. In 1977, ERDA and FEA were combined and replaced by the Cabinet-level Department of Energy.

The creation of the Department of Energy succeeded in unifying many energy, national security, and scientific programs that previously were scattered throughout the Government. However, the diverse origins of the Department's many elements resulted in an organization consisting of multiple cultures, traditions, and modes of operation, which have never been fully harmonized. In addition, with the end of the Cold War, even the Department's national security-related work is being performed in a far more open and interactive R&D environment--a substantial change from the days of the AEC, and further cause for greater integration of programs within the Department.

One of the driving objectives behind the Strategic Alignment Initiative has been to achieve a far more integrated and efficient operation. Development of the Department's April 1994 Strategic Plan was a vital first step toward securing a common vision and framework for future mission activities. Now comes the more difficult challenge of institutionalizing changes in how the Department functions and ending many programmatic separations that the Department inherited from the past.

ALIGNMENT AND DOWNSIZING

In December 1994, 40 career employees from throughout the Department were selected to work full-time on the Strategic Alignment Initiative. Under the direction of Deputy Secretary Bill White, this team received training in how the private sector has implemented successful restructuring efforts. During the subsequent four months, the Strategic Alignment team conducted interviews and surveys aimed at examining how the Department conducts its business and ways in which we could secure better performance at lower cost. This process provided essential inputs to our Alignment and Downsizing package: out of 39 recommendations that were presented, 24 were adopted in whole or in part, 13 will receive further consideration during the implementation process, and two were rejected--1) a recommendation to privatize isotope production, and 2) a recommendation to further reduce expenditures of the Environmental Management program by $300M-$500M annually. The package also is derived from other analytical work aimed at helping deliver on our commitment of $14.1 billion in deficit reduction over the next five years.

Highlights of our Alignment and Downsizing Package are listed below, organized according to four guiding principles that are consistent with the National Performance Review's tenets of putting customers first, cutting red tape, cutting back to basics, and empowering employees to get results.

Alignment Summary

($ in thousands) (FY96 - FY2000)	$ Savings	Employment Reductions	Percent of 1995 Staff
Consolidate Headquarters Space	17,981		
Alignment - Headquarters Administration	109,285	377	
Alignment - Headquarters Program Offices	228,587	761	
Reduce Headquarters Support Service Contractors	309,525		
Integrate Information Management	200,000		
Reengineer Headquarters	247,910	1,200	
HEADQUARTERS & PROGRAM TOTAL	1,113,288	2,338	34%
Field Offices	502,899	1,450	21%
TOTAL	1,616,187	3,788	27%
Travel Savings	175,000		
Asset Sales Savings	75,000		
National Environmental Policy Act Savings	20,000		
Additional Alignment Savings	50,000		
Less Retraining, Outplacement and Buyout Costs	(165,540)		
TOTAL ALIGNMENT SAVINGS	1,770,647	3,788	27%

Principle #1: **Use fewer resources by eliminating redundancies, reducing the workforce, and streamlining processes.**

Problem: The Department uses more resources and is less efficient than it should be due to excessive layers of management and duplicative work. Bureaucratic layers and organizational redundancies are the result of confusion over roles and responsibilities, a lack of vigilance in eliminating duplicative work, and failure to eliminate non-value-added layers and processes.

Opportunities: The Strategic Alignment team identified many opportunities to eliminate, consolidate, and downsize redundant activities across the Department, resulting in substantial staff reductions and savings over the next five years. Some downsizing will be permitted through the establishment of matrixed organizations with shared staffing; additional cuts will result from organizational consolidations and the elimination of redundancies. The Department has increased its supervisor to employee ratio from approximately 4.7 in September 1993 to 7.0 in April 1995, but we must still do more to achieve--if not exceed--our goal of 10:1.

Major opportunities for reducing resources and downsizing employment also can be found through revamping and simplifying the Department's complex processes for decision-making and administrative action. Put another way, by reducing red tape we will be able to reduce the number of federal and contractor employees who have been involved both in dispensing the tape and in trying to cut through it to perform their work. Because of time constraints, the Alignment team could not re-engineer major departmental processes. However, we must seize the major opportunities that would permit us to use fewer resources through dramatically simplified processes across-the-board. Based on successful process re-engineering in the private sector, we are confident that the Department's federal and contractor workforce can be reduced dramatically.

Actions: Reducing Federal Employment: Over the next five years, the Department's federal employment will be reduced by 3,788 (27 percent) over five years, from our FY1995 target of 13,907 Full-Time Equivalents (FTEs). This number excludes employment of the Power Marketing Administrations (5,227) and the Federal Energy Regulatory Commission (1,463). This 27 percent FTE reduction greatly exceeds the eight percent reduction which the Department committed to in its September 1994 Streamlining Report to the Office of Management and Budget (OMB). A cut of this magnitude is commensurate with the estimated 27 percent reduction in DOE contractor employees that will occur between 1992 and 1998. We will fully utilize all available tools--including buy-out authority, attrition, early retirement, out-placement services, and retraining assistance--to soften the impact on our employees. We also intend to prepare a workforce restructuring plan. However, no matter how we approach this challenge, some involuntary separations will be required to meet the employment targets.

Implementation of the workforce reductions will be managed by the Alignment and Downsizing Implementation Team (discussed at the end of this report) and will be achieved without compromising worker health and safety. New FTE caps for federal employees will be submitted to OMB by the Implementation Team in order to secure the approximately $1 billion in savings over five years that will result from these workforce reductions. Specific elements of the downsizing include:

1) ***Cutting Headquarters Staff***: Headquarters staff will be reduced by approximately 2,340 (34 percent), from a 1995 level of 6,850 (this number includes some staff who are duty-stationed in the field, but are reported as Headquarters personnel). Between 1987 and 1994, DOE Headquarters staff grew substantially. The largest areas of growth were in the Environmental Management and Environment, Safety, and Health programs. Increases in these programs were required in order to obtain the skills mix required by the expanding environmental clean-up program and to address worker health and safety issues. During the Headquarters staff drawdown, we will ensure retention of the skills necessary to perform these and other vital Departmental missions.

2) ***Cutting Field Office Staff:*** Field Office staff will be reduced by 1,450 (21 percent), from a 1995 level of 7,047. These cuts will involve reductions in staff across the field complex, as well as office closings and consolidations (discussed below).

Restructuring and Downsizing Departmental Offices: Significant redundancies will be eliminated and departmental performance will be enhanced through a number of structural changes in the Department, including:

1) ***Realign Energy Cluster:*** We will realign the Offices of Energy Efficiency, Fossil Energy, and Nuclear Energy, and the Energy Information Administration, as well as portions of the Office of Policy, within a new Energy Cluster. This action will eliminate redundant functions through utilization of common staff for many administrative, policy, regulatory, and budget activities, and will enable a more integrated approach to management of the Department's energy portfolio. At present, this action will not involve elimination of Assistant Secretary positions. Realigning the Energy Cluster will enable a reduction of 250 Headquarters employees and elimination of $98 million in support service contractor activities, for a total savings of $180 million.

2) ***Consolidate Emergency Management:*** We will consolidate six existing Headquarters organizations that deal with emergency management into one office in the National Security Cluster. This change will improve effectiveness and responsiveness of the emergency response staff at Headquarters, and result in a reduction of 24 FTEs.

3) ***Merge Public and Congressional Affairs:*** We will combine and downsize the Office of Public Affairs and the Office of Congressional Affairs, and reduce the size of "shadow staff" at the line programs who perform congressional and public affairs functions. Tools such as staff matrixing will be used to better connect the merged office with program offices. The new office will provide better service to our customers in the public, Congress, State and local governments, and the media.

4) ***Create an Administrative Service Center:*** We will establish an integrated Administrative Service Center that will provide customer service in areas such as personnel, procurement, training, and administrative services. The Service Center will be staffed with a mix of employees from the current Human Resources organization and the program offices--where many redundant capabilities have built up over the years. In addition, the Department will consolidate the 18 offices that currently process accounting transactions.

5) ***Realign the Office of Policy:*** We will reduce the Office of Policy, Planning, and Program Evaluation from its current size of 200 employees to a 75-person staff that reports to the Secretary, distributing 50 policy staff to the programs and eliminating approximately 75 positions. The remaining Office of Policy will include a strengthened economic analysis capability and house international activities currently performed in the program offices.

6) ***Other Office Downsizing Actions:*** Numerous other changes in staffing levels and functions were identified by the Alignment Team. Through the Alignment and Downsizing Implementation process, we will implement many of these additional recommendations and will allocate specific staff reductions to offices throughout the Department.

Reductions in M&O Contractor Employees: Through efforts outside the Alignment and Downsizing Initiative, we will have reduced employment of the Department's management and operations (M&O) contractors by more than 28,000 (20 percent) by the end of FY1996, from a 1992 level of 148,700 to a 1996 level of 120,000. More than 70 percent of these reductions have occurred as a result of employee cuts at our environmental management sites and former nuclear production facilities. We expect to cut thousands of additional contractor employees by FY2000.

Regarding contractor employees at the Department's laboratories, we are setting a goal of a 10 percent reduction over the next five years, which would result in a cut of approximately 5,900 employees from a FY1994 workforce base of approximately 59,000. This reduction would be facilitated through reform of the Department's oversight procedures of the labs--enabling the labs to eliminate employees and streamline internal systems of operation. Some workforce reductions at the labs also will be the direct result of cuts in programmatic funding. However, one of our overall Alignment and Downsizing goals is to preserve our mission activities within a declining budget environment by exacting significant cuts in overhead costs. Details of the reductions in employment levels at the Department's labs will be developed through implementing recommendations of the Galvin Task Force report on the DOE National Laboratories. A plan will be released with our FY1997 budget.

Principle # 2: **Reduce overhead expenses so that we deliver more mission activity for less money.**

Problem: A growing proportion of our budget in recent years has been devoted to federal and contractor overhead costs, including administrative personnel, office leases, computer systems, support service contractors, and travel.

Opportunities: The Department has many opportunities immediately available to reduce overhead. Both contractor and federal workforce reductions will help ensure that our workforce levels track with the Department's overall budget. The Department reduced its budget from $19.2 billion to $17.5 billion during the past three years and has committed to reduce spending to $14.7 billion (23 percent) by the year 2000. Our projected reduction of 27 percent in federal employment and at least 27 percent reduction in contractor employment during this period will ensure that we are rightsized to perform our missions without sustaining personnel expenses that would cut into program budgets. Opportunities for further overhead reductions can be found in a broad range of contractor and federal expenses, ranging from shrinking the number of offices maintained by the Department to integrating and streamlining our information management systems.

Actions: Field Office Closings/Consolidations: The Department currently operates a field office structure that involves 64 offices with roughly 7,000 total employees in 25 states. To enhance efficiencies and reduce costs, we will close or consolidate 12 DOE field offices (19 percent) around the nation. As mentioned above, overall field office staffing will be reduced by approximately 23 percent. Details of the field office actions are as follows:

1) Four Energy Efficiency Regional Support Offices will be closed; they are located in San Francisco, California; New York, New York; Kansas City, Missouri; and Dallas, Texas. In addition, the Denver Energy Efficiency support office will be consolidated into the Golden, Colorado field office. These actions will be made possible as a result of consolidating several state grant programs into a "performance partnership"-type of block grant. Creation of a block grant program in this fashion will allow changing the work of regional support offices from grant-making and monitoring, to direct program operation. These changes will be implemented in FY1996 for a five-year savings of $38 million.

2) Four Fossil Energy offices will be closed, as follows: the Bakersfield, California and Casper, Wyoming offices which support the Naval Petroleum and Oil Shale Reserves will be closed with the passage of legislation to privatize the Reserves. The Fossil Energy offices at Metairie, Louisiana and Laramie, Wyoming will be closed. These two office closures will be completed in FY1996.

3) Two Office of General Counsel offices which are involved in completing work of the former Economic Regulatory Administration, will be closed. These are located in Houston and Dallas.

4) A small policy office in Paris, France which reports to the Office for Policy, Planning and Program evaluation will be closed.

5) Management and administrative functions at the Morgantown Energy Technology Center (Morgantown, West Virginia) and the Pittsburgh Energy Technology Center will be consolidated. This action will eliminate 90 federal FTEs. In addition, the Department will examine further opportunities for consolidation and cost-savings among its three fossil energy technology centers (Morgantown, Pittsburgh, and Bartlesville, Oklahoma). Further decisions regarding these offices will be made this year.

Headquarters Space Consolidation: The Department's Headquarters' staff will be consolidated from its present distribution among 16 different locations in the Washington, D.C. metropolitan area to just four locations by FY 2000--Forrestal Building; COMSAT Building (two blocks from Forrestal); Germantown, Maryland; and a Crystal City, Virginia building that houses DOE's Naval Reactors program staff. This consolidation will reduce leasing expenses and increase efficiencies through greater integration of the Department's workforce.

By FY 2000, Headquarters workforce reductions will enable the Department to vacate more than half of its 2,000-person Germantown facility, located 25 miles from the Forrestal Building. Substantial savings would be achieved in deferred travel costs associated with transporting employees between these multiple sites, particularly between Forrestal and Germantown. The Department currently spends approximately $250,000 annually on a shuttle bus service to move an average of 200 employees daily among existing Headquarters offices. After the year 2000, consolidation of all employees out of the Germantown facility and into a facility much closer to the Forrestal building may be feasible and would be implemented based on a thorough assessment of potential cost savings.

Curbing Travel Expenses: The Department will substantially reduce its travel costs through better management of travel decisions, utilization of spending caps, negotiating cheaper airfares for contractors, and better utilization of technology. At present, the Department spends $365 million annually on travel for federal and contractor employees--approximately three-fourths of which is contractor travel. The Department has over 115 videoconferencing rooms (including roll-around units), and has utilized these facilities for more than 10,000 videoconferences since 1993. We will install an additional 100 units during the next year to further reduce the need for travel. Savings of $175 million will be realized over five years.

Asset Sales: The Department will sell surplus assets over the next five years to generate $75 million in revenue and reduced overhead costs associated with storage, security and handling. Included in the Department's existing asset inventory are more than 10,000 pounds of precious metals (e.g., silver, platinum, gold), more than five tons of non-precious metals (e.g., lead, copper, stainless steel, aluminum), and large volumes of rare gases. These assets were required by the nuclear weapons production complex during the Cold War years, but are excess inventory today.

Information Management: We will reform and restructure our information management systems to generate $200 million in savings over five years. At present, the Department's information infrastructure is comprised of a complex set of duplicative and in many cases incompatible systems. Savings will be achieved through eliminating unnecessary or duplicative systems; consolidating computer, telecommunications, and information distribution operations; and reducing acquisition costs through consolidated bulk purchases. We will establish a position of Chief Information Officer who will oversee the development of an integrated information management and communications system for the Department.

Cut Support Service Contractor Costs: The Department will spend $90 million less annually on support service contracts, for a five-year savings of $460 million. At present, the Department spends close to $700 million a year on support service contractors. These short-term contractors help the Department achieve its missions without requiring long-term staffing increases. However, substantial growth in the use of support service contractors has resulted in an over-reliance on their services and excessive costs to the Department. In curbing the use of support service contractors, we will be empowering federal workers by returning to them many tasks that we have been hiring contractors to fulfill out of tradition or convenience.

Principle #3: **Discard old work and privatize, eliminate, or transfer functions that can be performed better elsewhere.**

Problem: The Department of Energy was created by combining a broad range of functions from throughout the government, including several functions which now could be privatized or transferred. One example is the Naval Petroleum Reserves Program, established in the early 1900s to ensure a secure source of crude oil for the Navy. The Reserves no longer serve that purpose. Instead, they are operated today strictly as commercial ventures and thus properly belong in the private sector.

Opportunities: The President's FY1996 Budget request includes the policy decision to privatize the Naval Petroleum Reserves and parts of the Power Marketing Administrations (PMAs). By removing these type of functions from the Department, we will be able to sharpen our focus more directly on those areas that are central to our strategic plan.

Actions: Submit Legislation to Implement Administration Policy on the Power Marketing Administrations: The Administration will submit legislation this month to Congress that would implement its policy decision to: 1) establish the Bonneville Power Administration as a wholly-owned government corporation; and 2) transfer the Western Area, Southwestern and Southeastern Power Administrations to their utility customers for a sale price based on the net present value of the principal and interest payments that the Treasury presently expects to receive from each PMA in the future. Passage of this legislation would free these organizations from burdensome federal procurement and personnel rules and enable them to be more responsive to their customers. Making Bonneville an independent government-owned corporation will reduce the Department's employment by 3,350 FTEs, eliminate 1,744 contractors, and remove from the Department 25 offices. (The employees of the resulting Bonneville government-owned corporation would still be federal employees, but not within DOE; how many of the 25 offices would be retained would be determined by the corporation.) Privatizing the three PMAs mentioned above will reduce the federal workforce by approximately 1,700 FTEs, eliminate 975 contractor employees, and result in the closure of 56 DOE offices.

Submit Legislation to Privatize the Naval Petroleum Reserves: The Department will submit legislation this month to Congress that authorizes the Department of Energy to prepare a sales strategy and offer the Naval Petroleum Reserves for sale to the private sector in FY1997. Net revenue to the Treasury from enactment of this legislation and sale of the Reserves is estimated at $1.6 billion.

Submit Legislation to Detach the Federal Energy Regulatory Commission from the Department: The Department will submit legislation to Congress this month that would remove the Federal Energy

Regulatory Commission (FERC) from the Department. When the Department was formed and FERC was established "within the Department," the Nation was in the midst of an energy crisis, oil and gas price controls were in effect, and a substantial number of new laws governing energy supply and demand had been, and were being enacted. Very close coordination was required between energy policy and energy regulation.

In the 18 years since, much has changed and it no longer appears necessary to maintain FERC within the Department. Legislation that would make FERC fully independent would clarify and emphasize its status as a regulatory body and would free FERC from the tangled jurisdiction and constraints that accompany its current position in the Department. Enactment of this legislation would eliminate approximately 1,450 employees from the Department, although they would remain federal employees.

Principle #4: **Eliminate unnecessary and redundant regulations and red tape that impose excessive cost burdens on the Department's performance of its missions.**

Problem: Over the past 15 years, the Department has adopted an increasingly burdensome approach to managing its many laboratories and facilities. One example is found in the highly prescriptive and complex regulatory framework for our M&O contractors which is embodied in a large volume of departmental directives--which govern issues ranging from environment, safety, and health to business management and maintenance of classified documents. The directives system, our existing procurement system, and many other processes of the Department are mired in red tape--causing increased costs to the taxpayer for no real value.

Opportunities: Many deregulatory actions in relation to the Department's governance of its laboratories and facilities are being undertaken in the context of our response to the Task Force on Alternative Futures for the DOE National Laboratories (the Galvin Task Force). Others opportunities for cutting red tape are found in re-engineering processes such as preparing National Environmental Protection Act (NEPA) paperwork.

Actions: Streamline Burdensome Oversight of our Facilities: We will continue to aggressively implement actions that will reduce compliance costs and increase performance of our facilities and laboratories. These actions include: simplifying, reducing, and reissuing departmental directives with the goal of cutting them by 50 percent by December 1995; instituting a fundamentally new approach (called the "necessary and sufficient process") to the application of Departmental directives; simplifying and streamlining the Department's audits and appraisals of its laboratories; introducing a wholesale change in procurement practices for DOE contractors; working with the labs to remove costs from their operations as a result of simplified DOE oversight; and moving toward external regulation of our labs and facilities. The savings from these efforts will be reported within the package of measures associated with Galvin Implementation actions. These actions are extremely relevant to the Strategic Alignment and Downsizing package because they represent process re-engineering which will enable cost reductions, enhanced responsiveness of the Department, and personnel reductions.

National Environmental Policy Act Process Reform: The Department is cutting in half--from 33 months to 15 months--the average time it takes for preparing environmental impact statements. We are achieving this goal through innovative contracting, better internal management of NEPA costs, and process improvements. These actions will result in savings of $20 million over five years.

IMPLEMENTATION

To ensure that the alignment and downsizing actions outlined in this report are completed in a timely fashion, we have established an Alignment and Downsizing Implementation Team. Chaired by Don Pearman, Associate Deputy Secretary for Field Management, this team will include several members of the Strategic Alignment team, as well as representatives from Department offices. This group will be responsible for:

1) Reviewing, coordinating, and monitoring detailed implementation plans which will be developed by affected organizations within the Department.

2) Developing an implementation plan for the FTE allocations for each Department office that will be required to meet our downsizing targets.

3) Identifying major Department policy and administrative processes which should be re-engineered for the purpose of enhancing performance, cutting costs, and achieving the FTE reduction commitments contained in this report.

4) Providing further analysis of opportunities for alignment and downsizing of the Department, including additional examination of issues identified by the Strategic Alignment team.

5) Providing regular reports to the Secretary on progress on all alignment and downsizing commitments.

CONCLUSION

The Department's missions in national security, energy, weapons site cleanup, and science and technology are extremely demanding and of great importance to the future of the Nation. Our challenge is to perform these responsibilities within a shrinking budgetary environment. This requires that we do things differently in the future than we have in the past. We must simplify and make sense out of internal processes that currently are burdensome and redundant, and we must save dollars across-the-board. The path we have charted, through the Strategic Alignment and other initiatives, is both exciting and daunting. Downsizing within the Department will be difficult and restructuring our activities will bring new anxieties to the workforce. However, this is the better way than sacrificing the Department's missions through dismantlement. Creating a government that works better and costs less is a compelling and exciting goal. We have embraced that goal and are proving that it can be done at the Department of Energy.

APPENDIX A: ALIGNMENT AND DOWNSIZING AT A GLANCE

- **Total DOE Downsizing:** Over the next five years, DOE staff will be reduced by 3,788 employees (27 percent) from our Fiscal Year 1995 target level of 13,907, resulting in five year savings of $1 billion. Sixty-seven percent of the total cuts will be accomplished in the first two years. [The base level excludes employment of the Power Marketing Administrations (5,227) and the Federal Energy Regulatory Commission (1,463).]

- **Headquarters Staff Downsizing**: Headquarters employment will be reduced by approximately 2,340 (34 percent) over the next five years, from a 1995 level of 6,850 (this number includes some staff who are duty-stationed in the field, but are reported as Headquarters personnel).

- **Field Staff Reductions:** Field office staff will be reduced by 1,450 (21 percent) over the next five years.

- **Field Office Closings and Consolidations:** We will close or consolidate 12 DOE field offices around the Nation. These include four Energy Efficiency Regional Support Offices, located in San Francisco, CA; New York, NY; Dallas, TX; and Kansas City, MO. In addition, the Denver, CO, Regional Support Office will be consolidated with the Golden, CO Field Office. The Fossil Energy Offices in Laramie, WY and Matairie, LA will be closed. The Naval Petroleum Reserves offices in Casper, WY and Bakersfield, CA will be closed with the privatization of the Reserves. Offices in Houston and Dallas, TX which support the DOE Office of General Counsel will be closed, as will a one-person policy office in Paris, France.

- **Overhead Cost Reductions:** Overhead costs will be cut through many initiatives, including: 1) Travel costs will be cut by $175 million over five years, from a current base of $400 million annually (75 percent of which is contractor travel); 2) More than $75 million in revenues and reduced overhead will be secured over five years through the sale of excess inventories of precious metals, non-precious metals, and rare gases that were needed during the Cold War for the weapons production complex, but can be sold today; 3) Headquarters offices will be consolidated from 16 to 4.

- **Office Alignment and Restructuring:** The Department's various energy offices will be restructured into a new energy cluster, with matrixed staffing. We will establish a new Administrative Services Center to provide personnel, procurement, and administrative services. Six headquarters organizations that deal with emergency management will be consolidated into one office. Most programs in the Department will be aligned and downsized to remove redundancies.

- **Legislative Package:** Legislation will be submitted to Congress to: 1) establish the Bonneville Power Administration as a wholly-owned government corporation; 2) privatize the Western Area, Southwestern and Southeastern Power Administrations; 3) privatize the Naval Petroleum and Oil Shale Reserves; and 4) make the Federal Energy Regulatory Commission fully independent from the Department. Enactment of these measures will result in $5.3 billion in deficit reduction.

APPENDIX B: BACKGROUND BUDGET CHARTS

Department of Energy
Strategic Alignment
May 3, 1995

($ in thousands) (FY96 - FY2000)	$ Savings by Year					
	1996	1997	1998	1999	2000	Total
Consolidate Headquarters Space	0	3,349	4,549	4,876	5,207	17,981
Alignment - Headquarters Administration	12,880	18,740	25,055	26,105	26,505	109,285
Alignment - Headquarters Program Offices	38,594	41,568	49,475	49,475	49,475	228,587
Reduce Headquarters Support Service Contractors	52,823	55,466	62,466	68,466	70,306	309,525
Integrate Information Management	40,000	40,000	40,000	40,000	40,000	200,000
Reengineer Headquarters	0	41,210	58,500	70,200	78,000	247,910
HEADQUARTERS & PROGRAM TOTAL	144,297	200,333	240,045	259,122	269,493	1,113,288
Field Offices	68,626	95,291	105,064	109,679	124,239	502,899
TOTAL	212,923	295,624	345,109	368,801	393,732	1,616,187
Travel Savings	35,000	35,000	35,000	35,000	35,000	175,000
Asset Sales Savings	15,000	15,000	15,000	15,000	15,000	75,000
National Environmental Policy Act Savings	4,000	4,000	4,000	4,000	4,000	20,000
Additional Alignment Savings	10,000	10,000	10,000	10,000	10,000	50,000
Less Retraining, Outplacement and Buyout Costs	(69,367)	(31,167)	(36,672)	(14,448)	(13,886)	(165,540)
TOTAL ALIGNMENT SAVINGS	207,556	328,456	372,436	418,352	443,846	1,770,647

Department of Energy
Strategic Alignment

May 3, 1995

Employment Reductions by Year

($ in thousands) (FY96 - FY2000)	1995 Base	1996	1997	1998	1999	2000	Total
Consolidate Headquarters Space							
Alignment - Headquarters Administration		192	84	91	10	0	377
Alignment - Headquarters Program Offices		594	46	122	0	0	761
Reduce Headquarters Support Service Contractors							
Integrate Information Management							
Reengineer Headquarters		0	634	266	180	120	1,200
HEADQUARTERS & PROGRAM TOTAL	6,851	786	764	479	190	120	2,338
Field Offices	7,047	594	410	150	71	224	1,450
TOTAL	13,898	1,380	1,174	629	261	344	3,788
Travel Savings							
Asset Sales Savings							
National Environmental Policy Act Savings							
Additional Alignment Savings							
Less Retraining, Outplacement and Buyout Costs							
TOTAL ALIGNMENT SAVINGS	13,898	1,380	1,174	629	261	344	3,788

APPENDIX C: REFORM SAMPLER

Better Environmental Screening Through Streamlining: The Chicago Operations Office worked with the Department's Argonne National Laboratory to improve processes for implementing the National Environmental Policy Act (NEPA). The process--crucial for identifying potential environmental problems--was time consuming and manpower intensive: 70 steps among 10 organizations meant a 100-day-plus approval cycle. Each environmental assessment--an analysis that determines whether a more comprehensive Environmental Impact Statement is required--was taking a year and a half, or more, to complete.

The new process--a result of analysis, stakeholder feedback, and consensus on common goals and procedures--has been a major success. The cycle time for completing environmental assessments has dropped from 100 days to 10 days, at most. A 24-step process was reduced to seven. Environmental assessments now require a few months, not years. The overall result: better, faster and more effective decision making.

Privatization Test Yields $140 Million: At the Savannah River Site, privatization has yielded significant savings and improved services. Working with the site contractor--Westinghouse Savannah River Company--three areas were targeted for privatization:

- The contaminated laundry services operation is now contracted off-site for a capital cost savings of $13 million. In addition, the private supplier is building a new facility in the area, creating new local jobs.
- Sludge treatment was privatized for a cost savings of nearly $24 million.
- The effort created the largest, single fixed-price subcontract for hauling on-site-generated sanitary waste, saving $103 million in construction and operating costs.

Based on these successes, DOE is exploring where similar programs can be applied elsewhere in its complex of laboratories and facilities.

Interactive Video and CD-ROM Cut Costs by 90 Percent: DOE staff from eight sites frequently traveled to a central location in Albuquerque, NM, for needed training in such areas as nuclear materials control. Travel, per diem and lost work time drove costs-per-employee as high as $900. In response, the Department introduced interactive video learning via satellite and replaced a 32-hour classroom course with an interactive CD-ROM course.

The initiative has driven down costs by a factor of 10--to $90 per student for the interactive video class. In addition, less time is taken from work schedules, and more students can take advantage of training opportunities. Because students can learn at their own speed, the CD-ROM has lead to faster course completion and better retention of information.

These are only three examples of how fundamental re-examination of our work is leading to bottom line cost savings and improved services. Many more examples could be shared from throughout the Department.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 4: On page 2 of your prepared testimony, you also state: "In June 1993, we established a Contract Reform Team , under the leadership of Deputy Secretary Bill White, to develop a plan for significantly improving the Department's contracting practices. The Contract Reform Team produced a report in February 1994."

Please provide a copy of (a) the charter for the Contract Reform Team, (b) a list of the Contract Reform Team's membership-including the job title for each member of the Team as well as any Team subcommittees/working groups/panels, and (c) a copy of that February 1994 report for the hearing record.

Answer: (a) There is no formal charter for the Contract Reform Team. However, the establishment, aims and objectives of the Team are set forth on pages 15 and 16 of the attached Statement of Hazel R. O'Leary ,Secretary of Energy, U.S. Department of Energy, Before the Committee on Energy and Commerce, Subcommittee on Oversight and Investigations, U.S. House of Representatives, May 26, 1993.

(b) Attached is a list of the Contract Reform Team members and staff. The Team identified nine major areas for detailed examination. Certain Team members were assigned lead responsibility to analyze the issues and develop recommendations. These nine areas and the Responsible Team Members were:

ISSUE AREAS	RESPONSIBLE TEAM MEMBER
Performance Criteria and Measures	William White, Deputy Secretary, Chairperson
Competition/Extension Policy	William White, Deputy Secretary, Chairperson
Non-Profit Contractors	Donald Pearman, Acting Associate Deputy Secretary for Field Management
Indirect Costs	Thomas Grumbly, Assistant Secretary for Environmental Restoration and Waste Management
Indemnification of Contractors	Robert Nordhaus, General Counsel, Vice Chairperson
Financial Management	Elizabeth Smedley, Acting Chief Financial Officer
Federal Oversight of Contractors	Archer Durham, Assistant Secretary for Administration and Human Resources
Use of Support Services	Archer Durham, Assistant Secretary for Administration and Human Resources
Litigation and Outside Counsel Fees	Robert Nordhaus, General Counsel, Vice Chairperson

Working groups, consisting of individuals with multi-disciplined technical and administrative skills and backgrounds, were established for each issue area. Each Working Group was responsible for identifying areas of investigation related to the specific issue, developing an analytical approach and schedule, and preparing a final report detailing their findings and making specific recommendations.

(c) A copy of the Report of the Contract Reform Team, Making Contracting Work Better and Cost Less, February 1995, is enclosed.

The Contract Reform Team is comprised of 15 Department of Energy representatives, as well as three representatives of the Office of Management and Budget. The membership encompasses both political and career officials, spans a wide variety of program and administrative offices, and includes both Headquarters and Operations Office representatives. Each member has an Alternate from his or her organization.

CONTRACT REFORM TEAM MEMBERS

William White, Deputy Secretary, Chairperson
Bob Nordhaus, General Counsel, Vice Chairperson
Cherri Langenfeld, Manager, Chicago Operations Office, Vice Chairperson
Dan Reicher, Deputy Chief of Staff, and Counselor to the Secretary, Vice Chairperson
Victor Reis, Assistant Secretary for Defense Programs, Vice Chairperson
Don Pearman, Acting Associate Deputy Secretary for Field Management
Archer Durham, Assistant Secretary for Administration and Human Resources
Tom Grumbly, Assistant Secretary for Environmental Restoration and Waste Management
James Decker, Deputy Director, Energy Research
Sue Tierney, Assistant Secretary for Policy, Planning, and Program Evaluation
Tara O'Toole, Assistant Secretary for Environment, Safety and Health
Jack Siegel, Acting Assistant Secretary for Fossil Energy
Betty Smedley, Acting Chief Financial Officer
Bob San Martin, Deputy Assistant Secretary for Utility Technologies
A. A. Pitrolo, Manager, Idaho Operations Office
Jack Sheehan, Office of Management and Budget, Office of Federal Financial Management
Stan Kaufman, Office of Management and Budget, Office of Federal Procurement Policy
Robert Civiak, Office of Management and Budget, Energy Branch Chief

CONTRACT REFORM TEAM STAFF

Agnes Dover, Office of the General Counsel
Carol Drury, Office of Public and Consumer Affairs
Mary Egger, Office of the General Counsel
Patricia Godley, Office of the Deputy Secretary
David Hepner, Savannah River Operations Office
Linda Johnson, Office of the General Counsel
Kathy Peery, Office of Congressional Affairs
Edward Simpson, Office of the Deputy Assistant Secretary for Procurement and
  Assistance Management

Statement of Hazel R. O'Leary
Secretary of Energy
U.S. Department of Energy
Before the
Committee on Energy and Commerce
Subcommittee on Oversight and Investigations
U.S. House of Representatives

May 26, 1993

INTRODUCTION

Mister Chairman and members of the Committee, I am pleased to appear before you today to discuss contract management in the Department of Energy (DOE). While protection of human health and the environment, energy research and policy, and national security are DOE's major missions, we cannot carry them out effectively and efficiently without improving our contract management. No Department in the Government is more dependent on contractor support than DOE.

I appreciate the opportunity to explore with you today the DOE's current problems in this critical area and ways that we plan to address them. This is a great challenge and therefore I particularly welcome the chance to work cooperatively with you and members of the Energy and Commerce Committee to ensure that the Department discharges its critical energy, environmental, and defense responsibilities in a fiscally prudent manner. I am excited about the challenge of "reinventing" the way the DOE does its important business.

Reflecting my years in the business world, let me underscore my commitment to quality financial management in the Department. If we are to make real progress in contract management, we must aggressively change the way DOE conducts its business to ensure that there are clear expectations, accurate performance measurements, and careful contract monitoring. This must be a cooperative effort involving Departmental employees and contractors throughout the contracting system. We simply cannot put all the responsibility for this on auditors and inspectors at the end of the line. I will provide the needed leadership, but each one of my colleagues has a necessary role to play if we are to achieve quality financial management.

Although there have been some improvements, DOE continues to suffer from what the General Accounting Office (GAO) terms "systemic contract management weaknesses." Essentially, there is concern both inside and outside the Department that the unique contracting system that built the nation a nuclear arsenal of unsurpassed power, needs a major overhaul to accomplish the changing mission of cleaning up after the Cold War, managing the remaining warheads, strengthening our nonproliferation efforts, and pursuing critical science and energy missions efficiently and effectively.

Having acknowledged this concern, however, I want to stress that there are great differences of opinion about what needs to be retained and what needs to be changed in the current system. I intend, therefore, to take whatever actions are appropriate in the short-term to get on top of the problem and, over the longer term, to work aggressively towards fundamental reform.

I also need to stress that the problems and the reforms we will discuss today are not intended to be a sweeping indictment of the contractors who work for the Department or the federal managers who direct them. There is a large group of federal and contractor employees who strive to provide effective and efficient service. Instead, it is the overall system in which they work that demands our utmost attention and it is the contractors and federal employees abusing that system who must face real sanctions.

Background on DOE Contracting

The Department of Energy is the largest civilian contracting agency in the federal government with a broader range of contacting approaches than any other federal department. As you know, most federal agencies are made up predominantly of federal workers supported by some contractors. In contrast, DOE has under 20,000 Federal workers and more than 140,000 contractor personnel at Management and Operations (M&O) contractor sites and thousands more at other sites and Department headquarters. In fiscal year 1992, about $15.8 billion of DOE's $20.3 billion outlay went to management and operating (M&O) contractors and additional funds were spent on other types of contractors. M&O contractors conduct basic science and energy research, clean up contamination at Departmental facilities, and carry out the remaining post-Cold War nuclear weapons design, production and testing activities. While M&O contractors are the most visible, the Department increasingly relies on "support services" contractors to provide direct assistance to program managers. Beyond these activities, the Department also uses a variety of other contracting mechanisms, depending on program objectives, including fixed price contracting and environmental restoration management contracts.

Such a heavy reliance on contractors with a relatively small federal staff raises serious concerns about how effectively the Department can manage its missions and whether DOE personnel have the expertise necessary to do their jobs. I will return to this important point later in my testimony.

DOE's approach to M&O contracting has its roots in the Manhattan Project. The Federal Government, with a need for speed, secrecy and highly qualified individuals, found it essential to obtain the participation of industry and academia in the risky job of developing the bomb. The government gave contractors great independence in carrying out their missions, particularly building and operating the Department's weapons facilities. Thus, contract clauses in the weapons production area relieved the contractors of most financial risk and external oversight was limited by national security concerns.

Over several decades the M&O contract system remained largely unchanged. However, in the last few years with the end of the Cold War and the rise of what is now DOE's most costly mission -- the cleanup of the weapons plants -- there has been greater scrutiny of the M&O contract system. There also has been increased focus on the Department's reliance on support services contractors and other contracting mechanisms. The central conclusion of these reviews is inescapable: fundamental weaknesses in contract management make it imperative that we change the nature of contracting in the Department.

Weaknesses in DOE Contracting

GAO, DOE management, and the Department's Inspector General have highlighted a number of weaknesses in contract management. According to the GAO, these weaknesses include insufficient oversight of contractors, lack of management information essential to contract management, inadequate and nonstandard contract provisions, the use of cost-plus type contracts, and inadequate measurement criteria for contractor performance in the payment of contractor award and management fees.

DOE's own internal management reviews under the Federal Managers' Financial Integrity Act of 1982 have described related problems including inadequate auditing of contractors, weak project management practices, deficiencies in the budget formulation process, duplicative and ineffective information systems, insufficient staffing in key management areas, and inadequate financial management practices.

The DOE Inspector General has devoted a great deal of time to review of the Department's contracting problems. A series of Inspector General Reports have highlighted the following issues: inadequate federal control over M&O contracts, overly broad indemnification of contractors, inadequate contract administration staffing in DOE field offices, problems with the approach and implementation of DOE's recently adopted Accountability Rule, use of vague and nonstandard provisions in contracts, weak financial and accounting controls, inadequate DOE review and approval of contractor procurement and property management, and problematic administration of contractor pension benefits.

Each of these weaknesses has a highly detailed and complex basis which I will not elaborate upon today. However, common to all of them, Mr. Chairman, is a simple but fundamental problem: DOE is not adequately in control of its contractors and as a result the contractors are not sufficiently accountable to the Department. Quite clearly, this means that we are not in a position to ensure effective and efficient expenditure of taxpayer dollars in pursuit of our critical missions. Now is the time to reform our management practices.

While diagnosing the general problem is simple, finding an effective cure is not. It is tempting -- and probably wrong -- to suggest that we should simply scrap the entire M&O contract system. At the same time, it is clear that we must make fundamental changes in our approach to contract management.

There are several key principles that I believe must guide our thinking about reform. First, we have an obligation to every American taxpayer to spend his or her hard-earned dollars in an efficient and effective manner. The potential for waste, fraud and abuse must be in our sights at all times.

Second, the Department must state in clear language what we expect from contractors and develop effective ways to measure whether our expectations are met. Performance criteria and measurement mechanisms must be rapidly injected into our contracting system for all of our contractors, for example, national laboratories, cleanup companies, and support services contractors.

Third, we need a federal staff with sufficient experience and in adequate numbers to manage contracts. With ratios of contractors to DOE employees that exceed fifteen-to-one in some programs and a tradition of inattention to best management practices and training, we should not be surprised about the depth of the contracting problems we face.

Fourth, we need reward systems that better distinguish between superior and inferior contractor performance and federal program management. We also need accountability systems that do not leave taxpayers "holding the bag" in cases of contractor misconduct.

Finally, we need to ensure a clear separation between federal workers and contractors so that federal policy development and key program implementation activities are in federal hands. As cooperative as we must be with our contractors, it is ultimately federal workers who must ensure that governmental responsibilities -- as established by Congress and funded by taxpayers -- are effectively and efficiently discharged. This requires both sound business management and proper government administration.

Initiatives to Improve Contract Management

The weaknesses in contract management that I have outlined demand immediate attention and sustained care. In this regard, I am today announcing a series of short and long-term initiatives to improve contract management. The short-term initiatives are designed to produce real cost savings for taxpayers and to send a strong signal to contractors, Congress, and the public that we are serious about putting our financial house in order. The long-term initiatives are designed to make fundamental structural and functional improvements in the Department's approach to contracting.

1. SHORT-TERM INITIATIVES

a. Freeze Contractor Salaries

As the President and I announced on May 21, the Department will freeze contractor salaries for one year. By holding the line on salaries for one year we will reduce the base from which future salary increases and benefits will be calculated resulting in a savings over five years of about $1.5 billion. We plan to dedicate $1 billion of the savings to deficit reduction, $300 million to the DOE laboratories to support technology transfer, and $250 million to energy efficiency programs. I want to stress that freezing salaries will not halt promotions nor will it affect union employees because of existing labor agreements.

b. Reduce the Use of Support Services Contractors

I am concerned that the Department may be placing undue reliance on support services contractors. Too often contractors are called upon to carry out functions that are more appropriately the role of federal workers. This is in part a result of the difficulty the Department has had in securing additional full time equivalents (FTE's). It also reflects a failure in some cases to heed established management principles delineating when support services contractors are appropriate.

In response, I am today setting a goal to reduce DOE spending on support services contractors by 10% in Fiscal Year 1994 -- a savings of tens of millions of dollars. To accomplish this, I am directing each Program Secretarial Officer to review the use of support services contractors to determine whether they are truly necessary and are performing functions properly assigned to contractors. I am also directing them to determine whether they have adequate federal staff to oversee the contractors. I expect this review will, in many cases, produce demand for more Federal workers with greater skills. In Fiscal Year 1994, I believe we can meet the 10% goal through careful scoping of contractor work and increased efficiency in the delivery of services. However, some of the dollars saved will have to be spent on obtaining more and better Federal employee talent.

c. Increase Contractor Accountability for Civil Penalties

In recent months, there have been an increasing number of civil penalties assessed by states and the Environmental Protection Agency against the Department's contractors for violations of environment, safety and health requirements. I am concerned that we do not provide adequate incentives to prevent such penalties and, where appropriate, take sufficient disciplinary action when they are assessed against our contractors. At the same time, I recognize that in some instances contractor penalties reflect inadequate direction by Department managers. These inadequacies in our system can have serious financial implications because penalties are often reimbursed by the Department under current regulations.

Therefore, I am issuing this week a directive to program and field offices establishing procedures for DOE managers' response to the imposition of civil penalties against contractors. The directive will:

i) establish clear reporting requirements when penalties are imposed by states or EPA;

ii) require a detailed evaluation by the relevant contracting officer concerning whether the specific penalty is reimbursable under the Department's Accountability Rule and other regulations. This evaluation will consider, among other things, whether inadequate Departmental direction was a factor in the violation leading to the penalty; and

iii) permit the contracting officer to take additional steps, where appropriate, including a letter to a contractor's senior management, a reduction in award fee or management allowance, and, in extreme circumstances, termination of a contract.

I expect that each program and field office will implement the directive upon its issuance and report all civil penalties and supporting evaluations to the cognizant Program Secretarial Officer and the Associate Deputy Secretary for Field Management.

I fully recognize that civil penalties are only an element of contractor misconduct. Contractors may commit statutory and regulatory violations that do not lead to fines, fail to meet contract terms, or deliver substandard performance. The Department often does not respond in an aggressive manner that demonstrates a real commitment to accountability and a concern about scarce federal funds. In our overall review of contract management that I will discuss shortly we will take a critical look at solutions to these broader problems.

d. Control Indirect Costs

In the past, Congress has raised concerns that the Department and other agencies, are reimbursing contractors for "indirect costs" -- furniture, legal fees, automobiles, parties etc. -- that are either not allowable under procurement regulations or inappropriate in the public eye. While such expenditures are probably not sizable relative to the multibillion dollar DOE contractor budget, where they exist, they indicate that the

Department is not a careful guardian of the public purse. This causes erosion of public trust. DOE strongly supports the Administration's proposed "Contract Costs Act," which OMB Director, Leon Panetta, submitted to Congress on May 5, 1993. That proposal would establish certification requirements and apply penalties to civilian agency contractors who seek reimbursement for unallowable overhead costs.

In order to gain greater control of indirect costs in the short-term, I am taking three steps:

(i) I will establish a "hotline" to the Department through which all contractors, employees and others will be able to relay confidentially expenditures that they believe are not appropriate;

(ii) I will establish a short-term Department-wide team to examine a sampling of indirect cost expenditures during FY 1993 to determine any particular categories that appear inappropriate. The results of such an inquiry will feed into the longer-term analysis of contracting I will discuss shortly. For example, the information will be useful in determining any changes that need to be made in the Department of Energy Acquisition Rule regarding indirect costs. The information will also be forwarded to the Office of Management and Budget for use in their efforts to develop allowable cost guidelines; and

(iii) If the short-term review indicates that problems with indirect costs are widespread, we will establish a permanent "inspection" team under the Assistant Secretary for Administration and Human Resources.

e. Improve DOE Acquisition Regulations

The Department of Energy Acquisition Regulations (DEAR) dictate to a large extent how the Department does its contracting. There has been criticism of the acquisition regulations on a number of bases. In our overall review of contract management that I will discuss next we will carefully consider changes that need to be made to the regulations. In the near-term, however, we have taken the following steps this week:

(i) We have issued a final rulemaking amending the acquisition regulations to standardize the manner in which contractors manage DOE property. For example, the new rule codifies a DOE directive requiring contractors to develop maintenance management programs promoting operational safety, environmental protection and compliance, property preservation and cost effectiveness;

(ii) We have issued a proposed rule amending the acquisition regulations to clarify the types of contract services covered by organizational conflict of interest regulations; and

(iii) We have issued a proposed rule amending the acquisition regulations to prescribe policies and procedures to improve the way contractors acquire federal information processing.

2. LONG-TERM INITIATIVES

a. Establish a Contract Reform Team

As I have noted, the need for contract reform is clear but the solutions are not. Given the complexity of the issues -- and the great reduction in costs if we succeed -- we need an aggressive and in-depth inquiry into contract reform. Therefore, I am pleased to announce today my creation of a DOE-wide Contract Reform Team. I have charged the team with a top-to-bottom review of the Department's contracting mechanisms and practices. It will focus on a broad range of actual and potential contracting mechanisms: M&O, support services, fixed price, and environmental restoration management contracts. It will explore the advantages and disadvantages of each and the appropriate circumstances for their use.

The team will recommend specific administrative, financial and legislative improvements to contracting mechanisms and practices that will increase accountability, stimulate competition and simplify administration. Some of the key issues I expect the team to consider include: indirect costs, indemnification of contractors, the award fee/performance evaluation system, the treatment of non-profit contractors and subcontractors, non-competitive extensions of contracts, the Accountability Rule, procurement management, financial management systems, contractor salaries and benefits, performance measures of contractors, and the quality of federal oversight of contractors.

The team will include the key players on contracting at DOE headquarters and in the field including new appointees and career staff in the program offices, administration, procurement, general counsel, chief financial officer, environment, safety and health, and operations offices. The Office of Management and Budget will be closely involved with the activities of the team. The team will also consult with governmental and non-governmental experts including, for example, the DOE Inspector General, GAO, Congressional members and staff, and academics.

I expect the team to: be fully organized by June 15; provide me with a status report that identifies key issues by September 1; issue a draft report for review by November 1; and deliver a final report with detailed recommendations by December 31. I have selected the Deputy Secretary, when confirmed, to chair the team.

b. Improve Contracting through Departmental Realignment

Next week, I will be implementing a major Departmental realignment announced in April. The realignment, among other things, will improve our ability to manage contracting. In particular, I have directed the Assistant Secretary for Policy to develop Department-wide program evaluation criteria. Individual program managers will participate in the development of these criteria and will incorporate performance measures into their review of their functions including contractor performance. I have also directed the Office of the Assistant Secretary for Human Resources and Administration to develop the information systems required to ensure that managers have the information they need to determine whether they are meeting the program evaluation criteria.

Additionally, I have established the Office of the Associate Deputy Secretary for Field Management. This office will coordinate the activities of DOE's eight multi-purpose Operations Offices, each of which has direct responsibility for contracting. Through this office we will be able to impose greater discipline, where necessary, on the contracting practices of the Operations Offices. At the same time, the Associate Deputy Secretary will be in a position to disseminate across the Department the successes and failures in contract management from the individual operations offices and how the successes can be replicated and the failures avoided.

c. Examine Potential to Increase Ratio of Federal to Contractor Employees to Reduce Costs

In some DOE programs contractor employees outnumber federal employees by more than fifteen-to-one. This ratio is greater than in any other federal agency. Moreover, the ratio of contract employees to DOE field staff has increased from 26:1 to 28:1 over the period from 1990-1992, despite an increase in DOE employment of 2500. These disparities are, I believe, a significant factor in the Department's weaknesses in program and contract management. Most fundamentally, they impede our ability to give adequate direction to our contractors and ensure that this direction is followed. As I have noted, I am also concerned that some Departmental activities that are most appropriately the role of federal staff are being carried out by contractors.

I have begun a dialogue within the Administration to determine whether the Department's current federal personnel "ceiling" might be raised in exchange for reductions in contractor funding. In this way, I believe we can improve contract management, ensure that critical Departmental activities are in the appropriate hands, and save taxpayer dollars in the process.

d. Work with Organized Labor on Contract Issues

Contract reform can have significant impacts on organized labor at our sites. I hope to maximize opportunities and minimize problems through better communication and coordination with our labor stakeholders.

To this end, I will be meeting soon with the Presidents of the key unions representing thousands of workers at DOE facilities across the nation. I hope this will be the beginning of an improved relationship with organized labor that will allow us to move forward with contract reform and, at the same time, respond sensitively to union concerns.

e. Provide Quality Training to Improve Contract Management

In my previous positions in industry and government I have been a strong advocate for management training. I feel that training of our headquarters and field personnel in "quality management" is essential to more effective contract administration and better utilization of contractor capabilities. In particular, I believe that our managers could benefit greatly from a better understanding of management improvements made in private industry over the last decade.

To this end, we are collaborating with Motorola University and Milliken Industry, winners of the Malcolm Baldridge National Quality Award, to provide training in quality management to our program, field and administrative staff. In July, for example, many of our senior managers will attend Motorola University to study quality management principles and develop a plan to implement them across the Department. We will pay particular attention to contract management.

Conclusion

Mr. Chairman, it is clear that DOE faces serious problems in contract management. I believe, however, that with the cooperation of Congress we can accomplish substantial reform. I look forward to working with you and the other members of the Committee toward this important end.

DOE/S-0107

Making Contracting Work Better and Cost Less

Report of the Contract Reform Team

U.S. Department of Energy
Washington, DC 20585

February 1994

Printed with soy ink on recycled paper

Preface

The Department of Energy is strongly committed to President Clinton and Vice President Gore's efforts to reinvent our government. As the largest civilian contracting agency, the Department must significantly reform its contracting practices to meet this critical commitment.

The unique contracting system that built our nation a nuclear arsenal of unsurpassed power needs a major overhaul to accomplish effectively and efficiently the Department of Energy's changing missions: cleaning up after the Cold War, managing the nation's remaining warheads, strengthening our nonproliferation efforts, and pursuing critical science and energy initiatives.

Experts both within and outside of the Department have identified numerous weaknesses in our contracting practices. Common to all of these weaknesses is a simple, but fundamental, problem: DOE is not adequately in control of its contractors. As a result, the contractors are not sufficiently accountable to the Department, and we are not in a position to ensure prudent expenditure of taxpayer dollars in pursuit of our principal missions. Now is the time to reform our management practices, empower our managers to effect these reforms, and measure their success.

The problems that we identify and the reforms that we propose in this report are not intended to be an indictment of the contractors who work for the Department or the federal managers who direct them. Most federal and contractor employees strive to provide effective service. Instead, it is the overall system in which they work that demands our attention. We must create a system that focuses on efficient processes and quality results, rewards initiative and commitment, and provides meaningful disincentives where necessary.

Several key principles guide our thinking about reform:

- We have an obligation to every American taxpayer to spend his or her hard-earned dollars effectively and efficiently. The potential for waste, fraud, and abuse must be in our sights at all times.
- The Department must clearly state what we expect from our contractors and develop meaningful ways to measure whether they are meeting our expectations. We must rapidly inject into our contracting system performance criteria and measurement mechanisms for all of our contractors, including national laboratories, environmental cleanup companies, and support service contractors.
- We need a federal staff with sufficient experience, and in adequate numbers, to manage contracts. We should not be surprised about the depth of the contracting problems we face, with ratios of contractors to DOE employees that exceed 15 to 1 in some programs and a tradition of inattention to best management practices and training.
- We need to develop reward systems that better distinguish between superior and inferior contractor performance and federal

program management. We also need accountability systems that do not leave taxpayers "holding the bag" in cases of contractor misconduct.

- We need to ensure a clear separation between federal workers and contractors so that federal policy development and key program implementation activities are in federal managers' hands. As cooperative as we must be with our contractors, it is ultimately federal officials who must ensure that governmental responsibilities—as established by Congress and funded by taxpayers—are responsibly discharged.

I am pleased to report that we have already taken several meaningful steps that signal our commitment to contract reform. For example, we have frozen contractor salaries for 1994 (resulting in a $1.55 billion savings over five years), reduced budgeted expenditures for support services by 12 percent in 1994 (expected to result in a savings of nearly $100 million), and initiated innovative contracting approaches at several sites. As this report reflects, however, we have a long way to go.

I will personally ensure that the report does not sit on a shelf and gather dust. It lays out 47 specific actions we will take to make the Department's contracting process work better and cost less. The report also sets deadlines and assigns primary responsibility for implementation of each action to the Department's program and management officers.

There is, of course, no single right way to correct the problems we have identified. While the actions we propose appear effective and reasonable today, they need testing in pilot projects and program areas. Moreover, there is no quick fix. True reform will take time.

We readily admit this is a "work in progress." Therefore, prior to putting these recommendations into effect we will seek the input of our stakeholders on the proposed actions, and we stand ready to revise them as appropriate.

I want to thank the many people who contributed to the Department's contract reform effort, including the Contract Reform Team Chairman, Deputy Secretary Bill White; Vice Chairpersons Robert Nordhaus, Cherri Langenfeld, Dan Reicher, and Victor Reis; the members of the Contract Reform Team, including representatives from the Department and the Office of Management and Budget; the Contract Reform Team Staff, including Mary Egger, David Hepner, Linda Johnson, Edward Simpson, Agnes Dover, Pat Godley, Carol Drury, and Kathy Peery and the many other Departmental personnel who supported the team's efforts; representatives of the General Accounting Office; Members of Congress and their staff, including Senators James Exon, John Glenn, Bennett Johnston, and Sam Nunn and Representatives Tom Bevill, Ron Dellums, John Dingell, Philip Sharp, John Spratt, and Mike Synar; and our other stakeholders, including state and local governmental officials, current and prospective contractors, labor unions, nonprofit organizations, and private citizens. I deeply appreciate your experience, insights, and time.

Hazel R. O'Leary
Secretary of Energy

Contents

I. INTRODUCTION *1*

- *A. Contracting at the Department of Energy* *2*
  - *1. Major DOE Contracting Activities* *2*
    - *a. Management and Operating Activities* *2*
    - *b. Environmental Restoration Activities* *4*
    - *c. Support Services* *4*
  - *2. Cost-Reimbursement Contracts* *5*
- *B. The Need for Reform* *6*
- *C. Reinventing the Department's Contracting Practices* *8*
  - *1. Actions Recommended by the Contract Reform Team* *10*

II. MAKING DOE CONTRACTING WORK BETTER *19*

- *A. Selecting Alternatives to Traditional Cost-Reimbursement Contracts* *20*
  - *1, Increasing the Use of Fixed-Price Contracts* *20*
  - *2. Developing and Using Performance-Based Management Contracting Tools* *21*
    - *a, Performance Criteria and Measures* *22*
    - *b. Incentives for Contractor Performance* *26*
    - *c. Special Incentives for Reducing Contract Costs* *29*
    - *d. Special Incentives for Environment, Safety, and Health Performance* *31*
- *B. Making Cost-Effective "Make-or-Buy" Decisions* *32*
- *C. Increasing Competition to Improve Performance* *36*
- *D. Streamlining the Procurement Process* *39*
- *E. Reducing the Use of Contracts for Support Services* *41*

III. IMPROVING DOE MANAGEMENT AND OVERSIGHT OF CONTRACTORS 45

- *A. Strengthening Financial and Accounting Systems 46*
  - *1. Financial Information Systems 46*
  - *2. Contractor Reviews 47*
  - *3. Department Personnel and Training 49*
- *B. Improving the Management of Particular Categories of Costs and Cost Controls 51*
  - *1. Indirect Costs 51*
  - *2. Property Management Costs 53*
  - *3. Contractor Pension and Insurance Costs 54*
  - *4. Overtime Costs 55*
  - *5. Uncosted Balances 55*
  - *6. The Advance-Funding Mechanism 56*
- *C. Modifying and Improving Cost-Reimbursement Policies 57*
  - *1. Applying the Accountability Rule 57*
  - *2. Comparing Acquisition Policies 58*
- *D.. Reducing Costs of Contractor Litigation 62*

IV. SPECIFIC INITIATIVES IN PROGRESS 65

- *A. Freezing Salaries of M&O Contractors 66*
- *B. Using Performance-Based Management Contracts at Rocky Flats 66*
- *C. Reforming Competition at the Idaho National Engineering Laboratory 67*
- *D. Financial Management Initiatives 68*
  - *1. Improving Contractor Financial Management Systems 68*
  - *2. Including Financial Management Systems in the Five-Year Planning Process 69*
  - *3. Standardizing and Strengthening Financial Management Contract Clauses 69*

[redacted]

4. *Requesting Audited Financial Statements of All Contractors 69*

5. *Reviewing Unfunded Liabilities 70*

E. *Converting a Cost-Reimbursement Contract to a Fixed-Price Contract—Hanford Site 70*

F. *Reforming the Naval Petroleum and Oil Shale Reserves Program 71*

G. *Making the Environmental Management Program a Pilot Program 72*

H. *Reducing and Streamlining Internal Regulations and Directives 73*

V. *NEXT STEPS 75*

VI. *CONCLUSION 79*

APPENDICES

A. *Contract Reform Team Membership and Structure 87*

B. *History of DOE's Contracting Practices 91*

C. *Criticisms of DOE's Contracting Practices by the General Accounting Office and the Department of Energy's Office of Inspector General 97*

D. *Stakeholder Meetings 103*

E. *Office of Environmental Restoration and Waste Management: Project Performance Study 107*

F. *Scientific Research Performance Measures and Criteria 113*

G. *Applied Technology Performance Measures and Criteria 121*

H. *Defense Programs Performance Measures and Criteria 129*

I. *Environmental Restoration and Waste Management Performance Measures and Criteria 139*

J. *Business Management Performance Measures and Criteria 147*

K. *Environment, Safety, and Health Performance Measures and Criteria 153*

L. *Contractor Evaluation and Selection Criteria 161*

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I.

Introduction

In June 1993, Secretary of Energy Hazel O'Leary formed a Contract Reform Team, chaired by Deputy Secretary Bill White, to evaluate the contracting practices of the Department of Energy and to formulate specific proposals for improving those practices.[1] This report summarizes the results of the work of the Contract Reform Team. It recommends actions for implementation that will significantly improve the Department's contracting practices and will enable the Department to help create a government that—in the words of Vice President Gore—"works better and costs less."[2] These actions and the deadlines for their implementation are listed at the end of this introduction. Among other things, they recommend replacing the Department's standard Management and Operating Contract with a new Performance-Based Management Contract and strengthening the Department's systems for selecting and managing contractors.

Contracting at the Department of Energy

The Department of Energy is engaged principally in four types of activities, each of which draws on substantial expertise in the private sector:

- Fundamental research in basic sciences.
- Development of applied science and technologies principally related to increasing efficiency, ensuring future energy supplies, and understanding the effects of energy use on the environment.
- Development of nuclear defense and nonproliferation technologies and strategies.
- Environmental restoration and waste management, principally at nuclear weapons production facilities.

To accomplish these and other functions, the Department relies extensively on contracts with private-sector organizations and academic institutions. In fact, the Department spent over three-quarters of its Fiscal Year 1993 budget on contracts.

Mission of the
U.S. Department of Energy

The Department of Energy is entrusted to contribute to the welfare of the nation by providing the scientific foundation, technology, policy, and institutional leadership necessary to achieve efficiency in energy use, diversity in energy sources, a more productive and competitive economy, improved environmental quality, and a secure national defense.

MAJOR DOE CONTRACTING ACTIVITIES

Most of the Department's contract expenditures fund three areas of activities: management and operations, environmental restoration and waste management, and support services.[3]

Management and Operating Activities

The Department has 52 contracts with various entities to manage and operate its numerous sites, including research and development laboratories and nuclear weapons production facilities. Of these, 34 are performed by for-profit companies, and the balance are performed by nonprofit organizations. These contracts generally are termed "M&O" contracts. As Figure 1 illustrates, DOE spent approximately $15.9 billion of its $18.2 billion total Fiscal Year 1993 procurement obligations on M&O contracts. Four of those contractors alone accounted for over $9 billion in expenditures[4] (Figure 2).

The Department's contracts for managing and operating DOE facilities originated with the Manhattan Project.[5] Based upon a need for speed, secrecy, and highly qualified individuals, the Manhattan Engineer District of the Army Corps of Engineers found it essential to obtain the participation of industry and academia in the risky job of developing nuclear weapons. After World War II, the Atomic Energy Commission and the Energy Research and Development Administration—both Department of Energy predecessors—determined that continued private-sector participation helped to preserve national security, through technological advances in both defense and civilian scientific activities in the Cold War era.[6]

To attract private industry to the high-risk and secretive job of designing and producing nuclear weapons, M&O contracts traditionally relieved contractors of most financial risk and provided for only limited external oversight of contractors' activities.

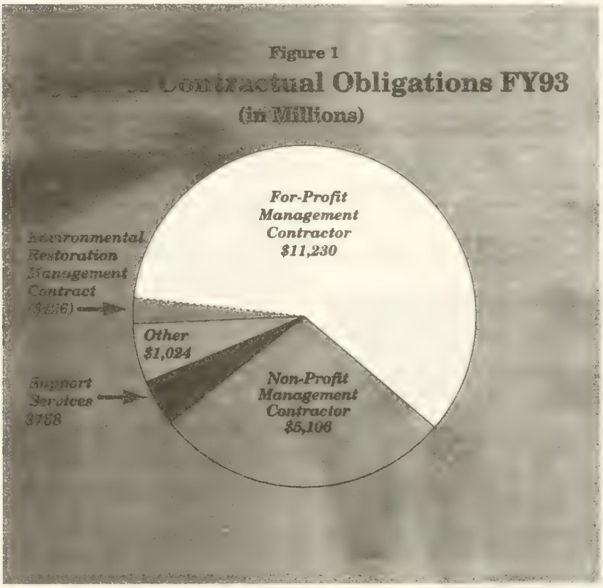


Figure 1

[illegible] Contractual Obligations FY93

(in Millions)

Moreover, M&O contracts assigned responsibility for all aspects of running a facility to a single prime contractor. Using one integrated contractor at each major facility made administration of contracts more convenient, facilitated the development of the integrated weapons complex necessary to the success of the program, and helped limit disclosure of classified operations. Over the years, some sites acquired more than one M&O contractor for certain functional areas, such as security, engineering, medical, and air transport services.

These traditional M&O contracting practices generally have survived in the post-Cold War era. These practices, however, do not necessarily make sense for facilities now focused on waste management and environmental restoration instead of weapons production. Companies that have specialized expertise in handling waste and environmental restoration typically are not defense contractors, and environmental work typically is more project-oriented than product-oriented.

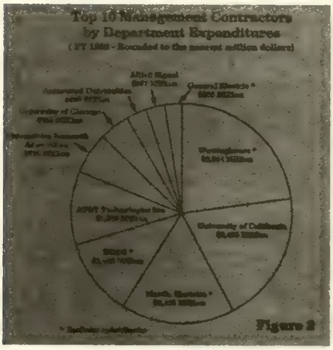


Figure 2

Environmental Restoration Activities

In 1992, the Department developed a variation of the traditional M&O contract to perform the environmental restoration activities required by the Department's post-Cold War mission. The Environmental Restoration Management Contract was intended to increase contractor accountability and federal oversight of contractor waste management and cleanup activities. DOE is using this new contract in one pilot program that accounts for approximately $426 million of the Department's $18.2 billion total procurement obligations (Figure 1). While the new contract attempts to correct some of the shortcomings of DOE's traditional M&O contracts, it is a cost-reimbursement contract that shares many features of the traditional M&O contract in need of reform.

Support Services

DOE obtains a variety of goods and services through contracts and procedures frequently used by other federal agencies. For example, it uses "support service" contracts for discrete services ranging from routine tasks (such as clerical support and moving services) to highly specialized technical support in various program areas. Support service contracts account for about $768 million of the Department's $18.2 billion total contracting costs. Substantial growth in support service contracts has caused an overreliance on contractor expertise to accomplish the mission of the Department. In addition, DOE's use of cost-reimbursement type contracts with poorly defined work requirements in support service contracts shifts the performance and cost risks to the Department.

COST-REIMBURSEMENT CONTRACTS

The Department historically has relied principally on three types of "cost-reimbursement" contracts:

- **Cost-Plus-Award-Fee Contract.** This type of contract compensates the contractor for costs that it incurs[7] in performing the contract, and provides for a fixed-base fee and an additional fee awarded on the basis of the Department's evaluation of the contractor's performance.
- **Cost-Plus-Fixed-Fee Contract.** This type of contract requires the Department to reimburse the contractor's incurred costs and to pay a fixed fee specified in the contract for contract performance.
- **Cost-Plus-No-Fee Contract.** This type of contract reimburses the contractor for its incurred costs. DOE pays no additional performance fee. However, in the case of contracts with academic institutions, the Department sometimes pays a management allowance to defray the expense of support by the institution.

The Need for Reform

Each type of contract used by the Department has its strengths and weaknesses. Cost-plus-award-fee contracts theoretically give contractors an incentive—in the form of the award fee—to perform well. Many of the Department's award-fee contracts, however, suffer from the absence of well-defined performance criteria and measures that would allow the Department to effectively evaluate whether and how much to award in fees.

To be effective, these performance measures must encompass:

- Policy-oriented, programmatic objectives.
- Business, management, and other financial objectives, such as financial accounting, cost containment, human resources, public responsiveness, and promotion of small and minority businesses.
- Environment, safety, and health objectives.

Also, the Department's financial management practices in general have failed to produce the information needed to allow senior federal managers to manage effectively. Cross-cutting data have been missing from the financial reporting system. Examples would include information about such items as the relative percentage of overtime spent across facilities, the percentage of basic research dollars spent on costs other than front-line researchers, the comparative costs expended on security per square foot of secured area, and the comparative cost per square foot of real estate management.

Finally, the effectiveness of the Department's contracting generally has suffered from the lack of competition for Departmental projects and contracts.[8] This problem has three principal causes. First, DOE has several long-term relationships

> *The DOE Inspector General has devoted a great deal of time to review of the Department's contracting problems. A series of Inspector General Reports have highlighted the following issues: inadequate federal control over M&O contracts, overly broad indemnification of contractors, inadequate contract administration staffing in DOE field offices, problems with DOE's recently adopted Accountability Rule, use of vague and nonstandard provisions in contracts, weak financial and accounting controls, inadequate DOE review and approval of contractor procurement and property management, and problematic administration of contractor pension benefits.*
>
> Testimony of Secretary Hazel R. O'Leary before the House Committee on Energy and Commerce Subcommittee on Oversight and Investigations

with particular contractors. When contracts with these contractors expire, DOE's contracting practices tend to favor extending the existing contractor's contract, rather than seeking competitive proposals from other contractors. Second, the government's procedures for obtaining contract proposals and awarding and administering contracts are burdensome, protracted, and costly, thus discouraging some of the most qualified market participants from doing business with the Department. Third, particularly in the programs concerning weapons design and production, waste management, and environmental restoration, some contractors have become increasingly reluctant to risk the adverse publicity associated with these activities.

The weaknesses in DOE's outdated contracting practices are significant and systemic. The correction of these weaknesses requires a thorough examination of the current mission of the Department and evaluation of the kinds of contracts needed to fulfill this mission at the lowest cost commensurate with quality performance.[9]

Reinventing the Department's Contracting Practices

Reinventing DOE's contracting practices requires a careful balancing of numerous, often countervailing considerations.

- **Diverse Mission.** DOE's diverse mission requires a wide variety of activities, principally basic research, applied science, weapons design and production, and environmental restoration and waste management. Given such a diverse universe of contracting requirements, the Department cannot adopt a single, formulaic approach to contracting.

- **Quality.** The importance of DOE's missions requires that the Department attract the best and the brightest individuals, companies, and institutions—both for-profit and nonprofit—to participate in performing DOE's tasks. In nonbureaucratic laboratory environments, scientists working with DOE and its predecessors have made immensely important scientific breakthroughs and have developed technologies significantly enhancing everyday life. These considerations favor providing many DOE contractors with a significant degree of flexibility and independence in determining how to do work, along with clear guidance and oversight concerning what types of work to do. The National Performance Review's plan to "reinvent government" contains some tenets of how to accomplish this mix: "assign responsibilities and measure outputs, delegate authority by empowering employees, and use incentives and penalties rather than mandates."[10]

- **Least Cost.** As a responsible government agency, the Department must also ensure that its tasks are performed at the least cost commensurate with quality results. The current fiscal condition of the U.S. government requires all the more sensitivity to costs. This consideration suggests strong incentives for cost savings must exist in the Department's relationships with its partners in the public and private sectors.

After a concentrated review of the Department's contracting practices, the Contract Reform Team proposes a fundamentally different approach to contracting and contract management at DOE intended to balance these policy considerations effectively.

The Contract Reform Team's principal focus has been on DOE's traditional cost-reimbursement M&O contracts. The combination of the team's recommendations results in a new form of management contract—a "Performance-Based Management Contract." This type of contract will be awarded pursuant to the same procurement authorities as the traditional M&O contract, but it uses essentially different contract tools to solve problems inherent in the traditional M&O contract, as illustrated in Table 1.

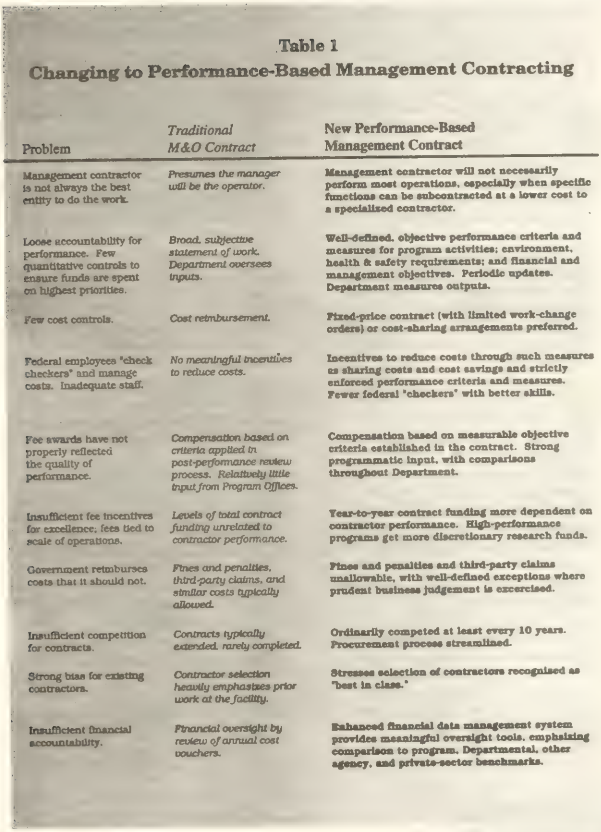


Table 1
Changing to Performance-Based Management Contracting

Problem	*Traditional M&O Contract*	**New Performance-Based Management Contract**
Management contractor is not always the best entity to do the work.	*Presumes the manager will be the operator.*	**Management contractor will not necessarily perform most operations, especially when specific functions can be subcontracted at a lower cost to a specialized contractor.**
Loose accountability for performance. Few quantitative controls to ensure funds are spent on highest priorities.	*Broad, subjective statement of work. Department oversees inputs.*	**Well-defined, objective performance criteria and measures for program activities; environment, health & safety requirements; and financial and management objectives. Periodic updates. Department measures outputs.**
Few cost controls.	*Cost reimbursement.*	**Fixed-price contract (with limited work-change orders) or cost-sharing arrangements preferred.**
Federal employees "check checkers" and manage costs. Inadequate staff.	*No meaningful incentives to reduce costs.*	**Incentives to reduce costs through such measures as sharing costs and cost savings and strictly enforced performance criteria and measures. Fewer federal "checkers" with better skills.**
Fee awards have not properly reflected the quality of performance.	*Compensation based on criteria applied in post-performance review process. Relatively little input from Program Offices.*	**Compensation based on measurable objective criteria established in the contract. Strong programmatic input, with comparisons throughout Department.**
Insufficient fee incentives for excellence; fees tied to scale of operations.	*Levels of total contract funding unrelated to contractor performance.*	**Year-to-year contract funding more dependent on contractor performance. High-performance programs get more discretionary research funds.**
Government reimburses costs that it should not.	*Fines and penalties, third-party claims, and similar costs typically allowed.*	**Fines and penalties and third-party claims unallowable, with well-defined exceptions where prudent business judgement is excercised.**
Insufficient competition for contracts.	*Contracts typically extended, rarely completed.*	**Ordinarily competed at least every 10 years. Procurement process streamlined.**
Strong bias for existing contractors.	*Contractor selection heavily emphasizes prior work at the facility.*	**Stresses selection of contractors recognised as "best in class."**
Insufficient financial accountability.	*Financial oversight by review of annual cost vouchers.*	**Enhanced financial data management system provides meaningful oversight tools, emphaizing comparison to program, Departmental, other agency, and private-sector benchmarks.**

The Contract Reform Team developed the Performance-Based Management Contract after numerous team meetings and studies by individual team members at DOE Headquarters and Field Offices. The Performance-Based Management Contract also reflects input received from numerous members of the public and other federal and state government sectors who have a stake in DOE's contracting process.[11]

The Performance-Based Management Contract and other innovative contracting approaches proposed in this report will meet the Department's goals—and the goals articulated in the National Performance Review—of making DOE's contracts work better and cost less, whether the Department is contracting for management and operation of DOE facilities, environmental restoration activities, or support services. However, implementing this approach is only a first step in what will be an ongoing process of continuous improvement and reform.

Other initiatives undertaken by the Department will be necessary to overcome some of the barriers needed for contract reform. Secretary O'Leary has initiated "total quality management" techniques at the Department, emphasizing strategic planning, teamwork, empowerment, and accountability for results. DOE also has begun a process of workforce restructuring to upgrade and change the skill mix of its managers. For example, project management skills and experience have become much more important as many of the Department's weapons production sites have moved from production to environmental cleanup. Increased emphasis on training in the best-of-class, private-sector financial and management information systems is necessary to monitor contractor performance and will require some shift of skills within the Department. These are examples of the upgrading of skills that is necessary as part of the Department's overall human resource strategic plan. This report will highlight these needs, but it will not substitute its conclusions for those of the strategic planning process on these very issues initiated by Secretary O'Leary.

ACTIONS RECOMMENDED BY THE CONTRACT REFORM TEAM

This report of the Contract Reform Team recommends a series of actions that will reform the Department's contracting practices and contract management techniques. Table 2 lists the specific actions the Department will take to make its contracting practices work better and cost less. It also sets deadlines and specifies "deliverables" for these actions, and identifies who is responsible for carrying them out. Because some of the actions will have far-reaching effects in DOE and among its stakeholders, in implementing the recommendations the Department will consider comments received from DOE personnel and stakeholders during the 30-day period following the publication of this report.

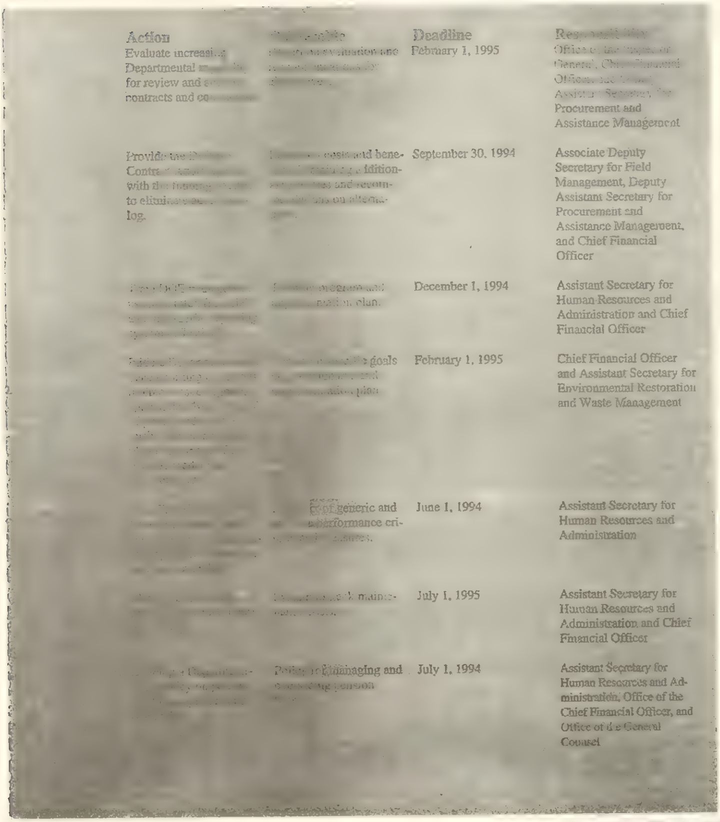
Table 2
ACTIONS RECOMMENDED BY THE CONTRACT REFORM TEAM

Action	Deliverable	Deadline	Responsibility
Review current M&O contracts and identify discrete tasks for fixed-price contracts and subcontracts.	Policy on identification of tasks, requirement for use of other than cost-reimbursement contract, and formal incentives to contractors for increasing percentage of fixed-price contracts.	June 1, 1994	Program Offices
Test the effectiveness of using fixed-price contracts.	Plan outlining periodic audits/reviews.	December 31, 1994	Deputy Assistant Secretary for Procurement and Assistance Management and Operations Offices
Develop programmatic performance criteria and measures.	A matrix of generic and programmatic performance criteria and measures.	March 31, 1994, for generic criteria and measures; June 1, 1994, for 15 largest M&O contracts; and December 31, 1994, for all others.	Program Offices
Develop business management performance criteria and mesures.	A matrix of generic performance criteria and measures.	March 31, 1994, for generic criteria and measures; June 1, 1994, for 15 largest M&O contracts; and December 31, 1994, for all others.	Cross-cutting team of representatives from Program Offices, Operations Offices, and Office of Environment, Safety and Health
Develop performance criteria and measures for securing superior environment, safety, and health performance.	A matrix of generic and specific performance criteria and measures.	March 31, 1994, for generic criteria and measures; June 1, 1994, for 15 largest M&O contracts; and December 31, 1994, for all others.	Cross-cutting team of representatives from Program Offices, Operations Offices, and Office of Environment, Safety and Health
Establish procedures for the development and use of performance criteria and measures.	Guidelines for the implementation of performance criteria and measures in the contracting process.	April 30, 1994	Program Offices, Deputy Assistant Secretary for Procurement and Assistance Management, and Office of the General Counsel
Train DOE program personnel in performance-based contracting.	Plan for training personnel in performance-based contracting.	May 1, 1994	Assistant Secretary for Human Resources and Administration

Action	Deliverable	Deadline	Responsibility
Create and implement tailored incentives for Performance-Based Management Contracts.	For-profit and nonprofit contractor incentive mechanisms.	July 1, 1994	Cross-cutting team of representatives from Program Offices, Operations Offices, and Office of Environment, Safety and Health
Establish an appropriate management fee policy for nonprofits.	Revised fee policy.	October 1, 1994	Associate Deputy Secretary for Field Management, Deputy Assistant Secretary for Procurement and Assistance Management, and Assistant Secretary for Energy Research
Establish compensation incentives for senior nonprofit laboratory personnel.	Performance-based incentive compensation policy for senior laboratory personnel.	October 1, 1994	Associate Deputy Secretary for Field Management, Assistant Secretary for Human Resources and Administration, and Assistant Secretary for Energy Research
Develop a DOE-wide incentive program for the contractor cost-reduction/cost-avoidance programs.	Policy guidelines and implementation plan.	September 1, 1994	Associate Deputy Secretary for Field Management, Deputy Assistant Secretary for Procurement and Assistance Management, Office of the Chief Financial Officer, and Operations Offices
Use cost-sharing arrangements in Performance-Based Management Contracts.	Require solicitation of cost-sharing arrangements in the selection process for new contractors.	September 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management and Assistant Secretary for Energy Research
Use multiple-fee arrangements in Performance-Based Management Contracts.	Policy guidelines on the use of multiple-fee arrangements.	September 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management
Develop incentives for environment, safety, and health risk-prevention programs.	Incentive mechanisms for environment, safety, and health risk-prevention programs.	August 1, 1994	Assistant Secretary for Environment, Safety and Health and Associate Deputy Secretary for Field Management

Action	Deliverable	Deadline	Responsibility
Obtain quality performance at the least cost, consistent with Departmentally approved program-specific factors.	Policy and program-specific criteria regarding DOE "make-or-buy" decisions.	August 1, 1994	Program Offices
Require management contractors to prepare "make-or-buy" plans.	Contractual requirements and associated incentives for an annual "make-or-buy" plan.	October 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management, Associate Deputy Secretary for Field Management, and Assistant Secretary for Defense Programs
Contract for routine services at the lowest practicable cost.	A plan setting forth criteria for buying landlord services, and a schedule for transition of work. This plan must address workforce displacements.	August 1, 1994	Operations and Field Offices
Except in unusual circumstances, automatically compete management contracts after no more than one extension.	DOE policy emphasizing competition.	August 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management, Assistant Secretary for Environmental Restoration and Waste Management, and Office of Energy Research
Negotiate the terms of the extended contract before making the extend decision, and make the decision-making process open to public scrutiny.	Revised extend/compete policy.	August 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management and Office of the General Counsel
Develop evaluation and selection criteria that increase competition.	Guidelines that will increase competition.	August 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management, Office of the General Counsel, and Operations Offices

Action	Deliverable	Deadline	Responsibility
Create a Procurement System Improvement Task Force to evaluate and streamline the Department's procurement process.	Report and recommendations to increase the speed, quality, and competitiveness of DOE procurements.	December 31, 1994	Deputy Assistant Secretary for Procurement and Assistance Management, Office of the General Counsel, and Operations Offices
Identify DOE support services that can be cost-effectively performed by federal employees.	Plan to reduce program costs and improve program management by converting contractor positions to federal positions over the next three years.	August 1, 1994	Program Offices
Reduce support service contracting by at least 10 percent in Fiscal Years 1995-97.	Plans for reducing support service contracting in FY 1995-97.	August 1, 1994	Program Offices and Office of the Chief Financial Officer
Implement performance-based contracting methods for support service contracts.	Plan for conversion to performance-based support service contracts.	June 1, 1994	Program Offices and Operations Offices
Improve DOE's financial management information systems.	Revised financial information system.	February 1, 1995	Chief Financial Officer and Program Offices
Ensure that the Office of the Inspector General's audit goals place high priority on reviews and evaluations of contractors' financial management systems.	Revised audit plans that reflect the new priorities of the Department.	December 31, 1994	Chief Financial Officer
Develop Department-wide guidelines for coordination of contractor oversight programs.	Guidelines for coordination of contractor oversight.	December 1, 1994	Associate Deputy Secretary for Field Management, Deputy Assistant Secretary for Procurement and Assistance Management, and Chief Financial Officer
Explore the use of alternatives to the Voucher Mechanism for Net Expenditures Accrued.	Report and recommendations on alternatives.	December 31, 1994	Chief Financial Officer



Action	Deliverable	Deadline	Responsibility
Evaluate increasing Departmental [illegible] for review and [illegible] contracts and [illegible]	[illegible] evaluation and [illegible]	February 1, 1995	Office of the Inspector General, Chief Financial Officer, and Deputy Assistant Secretary for Procurement and Assistance Management
Provide the [illegible] Contract [illegible] with the [illegible] to eliminate [illegible] log.	[illegible] costs and benefits [illegible] additional [illegible] and recommendations on alternatives.	September 30, 1994	Associate Deputy Secretary for Field Management, Deputy Assistant Secretary for Procurement and Assistance Management, and Chief Financial Officer
[illegible]	[illegible] program and [illegible] plan.	December 1, 1994	Assistant Secretary for Human Resources and Administration and Chief Financial Officer
[illegible]	[illegible] goals [illegible] and [illegible] plan.	February 1, 1995	Chief Financial Officer and Assistant Secretary for Environmental Restoration and Waste Management
[illegible]	[illegible] of generic and [illegible] performance criteria [illegible]	June 1, 1994	Assistant Secretary for Human Resources and Administration
[illegible]	[illegible] mainte[illegible]	July 1, 1995	Assistant Secretary for Human Resources and Administration and Chief Financial Officer
[illegible]	Policy [illegible] managing and [illegible] pension [illegible]	July 1, 1994	Assistant Secretary for Human Resources and Administration, Office of the Chief Financial Officer, and Office of the General Counsel

Action	Deliverable	Deadline	Responsibility
Develop Departmental policy on claims adjustment and evaluation of contractor risk management.	Policy for insurance risk management.	December 1, 1994	Assistant Secretary for Human Resources and Administration and Chief Financial Officer
Implement improved overtime policy.	Policy on use of contractor overtime.	April 1, 1994	Associate Secretary for Field Management and Assistant Secretary for Environmental Restoration and Waste Management
Conduct two reviews of uncosted balances each year.	Report on uncosted balances.	July 1 and November 1 annually	Chief Financial Officer
Re-examine the need for advanced funding through special bank accounts.	Report on continued need and alternatives.	October 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management Chief Financial Officer, and Office of the General Counsel
Revise the Department of Energy Acquisition Regulation provisions on fines and penalties, third-party liabilities, and related matters.	Notice of proposed rulemaking.	September 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management and Office of the General Counsel
Apply comparable reimbursement rules to non-profit contractors.	Notice of proposed rulemaking.	September 1, 1994	Deputy Assistant Secretary for Procurement and Assistance Management and Office of the General Counsel
Develop guidance on determining the "reasonableness" of contractor costs.	Guidelines on "reasonableness."	January 31, 1995	Office of the Chief Financial Officer, Assistant Secretary for Environmental Restoration and Waste Management, and Assistant Secretary for Defense Programs

Action	Deliverable	Deadline	Responsibility
Develop and implement a contractor indemnification scheme for response action contractors consistent with the principles of section 119 of CERCLA.	Notice of proposed rulemaking.	December 1, 1994	Office of the General Counsel
Issue uniform guidance on the review and oversight of contractor litigation.	Guidelines on procedures for litigation management.	March 31, 1994	Office of the General Counsel
Institute training in litigation management techniques.	Identification of training programs, and establishment of roundtable discussion format for Chief Counsel meetings.	March 31, 1994	Office of the General Counsel
Select one or two large pilot cases for immediate implementation of litigation cost-reduction techniques.	Report on pilot projects, including recommendations for cost reductions.	July 1, 1994	Office of the General Counsel
Develop an explicit policy concerning the allowability of defense costs in "whistleblower" cases.	Policy on allowablility of defense costs in "whistleblower" cases.	May 1, 1994	Office of the General Counsel

II.

Making DOE Contracting Work Better

The recommendations of the Contract Reform Team will result in fundamental changes to the Department's contracting practices. Specifically, instead of simply awarding or extending traditional cost-reimbursement contracts, DOE now will:

- Determine whether discrete tasks or functions can be performed and separately competed or subcontracted on a fixed-price basis.
- Develop objective, policy-based performance measures and incentives when a cost-reimbursement type of contract is appropriate for some or all of the work.
- Use the best contracting approach for a specific facility/site that addresses required work, policy-driven requirements, and incentives.
- Actively pursue and solicit competition for new contracts.

This new approach to contracting is outcome-oriented. It requires the development of definitive work scopes and objective performance measurement criteria to replace the ill-defined requirements now contained in most traditional cost-reimbursement contracts. Once specific performance criteria are established, DOE's contracts must fairly motivate contractors to meet those expectations. To accomplish this, the Department must have a central role in overseeing and evaluating contractor performance and in ensuring that DOE spends taxpayers' dollars prudently.

Accomplishing these changes will require altering the Department's previous system of incentives and reimbursement policies, as well as upgrading its managerial skills. The tasks are formidable and will take time, but the opportunities for substantial benefits demand change.

Selecting Alternatives to Traditional Cost-Reimbursement Contracts

A key objective of the Contract Reform Team's new contracting approach is greater reliance on alternatives to traditional cost-reimbursement contracts. These alternatives include increasing the use of fixed-price contracts and developing and using performance-based management contracting tools.

INCREASING THE USE OF FIXED-PRICE CONTRACTS

There appears to be no compelling reason to use cost-reimbursement contracts for a number of functions now performed by DOE's contractors. The Department could accomplish many routine functions now contracted out by using other types of contracts, such as fixed-price prime contracts and subcontracts in which delivered goods and services are provided at a fixed-price or on a unit-price basis. For example, contracts for specific air transport services and medical services could be priced on a fixed-price basis and obtained under an indefinite-delivery contract.[12] The costs of routine, repetitive services can be estimated with a fair degree of accuracy based on past experience with other contracts or on comparisons in the commercial marketplace.

Moreover, fixed-price contracts place full performance risk on the contractor. The contractor—not DOE—pays for any inefficiencies that increase the total cost of performance. In addition, fixed-price contracts do not typically entail all of the burdensome administrative oversight activities related to cost-reimbursement contracting, such as special cost accounting system requirements, monthly voucher submissions, indirect-cost management, and final contract audits.

Action: ***Review current M&O contracts and identify discrete tasks appropriate for fixed-price contracts and subcontracts.***

The Department should require DOE program officials to review and identify, on an ongoing basis, specific M&O contracts and specific tasks and services performed by its contractors, the costs of which can be reliably estimated and the work reasonably defined. Goods and services that can be procured on a fixed-price basis should not be contracted for on a cost-reimbursement basis. In addition, in increasing its use of fixed-price contracts, it is essential that the Department ensure that the contracts have specific, well-defined work scopes and outputs.[13] Because current, fixed-price contracts often fail to define clearly the work to be performed by the contractor, performance under fixed-price contracts commonly is characterized by frequent and substantial change orders, resulting in significantly higher actual costs than were originally intended to be "fixed."

The Department also should consider variations on fixed-price contracts, such as unit-price contracts and contracts that have specified incentives and disincentives for failing to meet deadlines and other goals.

Action: ***Test the effectiveness of using fixed-price contracts.***

Periodic reviews to ensure the implementation and effectiveness of this policy change are essential. Lessons learned at the various sites should be shared throughout the Department of Energy. For example, contractors performing similar types of functions at different sites should be benchmarked against one another, and federal managers should compare the relative percentage of fixed-price work between comparable contractors working on comparable problems. The Department should set year-to-year goals for each major facility, stating the minimal amount of work expected from a contractor under a fixed-price contract. Management contractor compensation should take into account the successful use of fixed-priced contracts and other alternatives to cost-reimbursement contracting.

DEVELOPING AND USING PERFORMANCE-BASED MANAGEMENT CONTRACTING TOOLS

Because DOE's traditional contracts for management and operating services account for the largest part of DOE's contracting budget, the Contract Reform Team concentrated a significant part of its efforts on these contracts. The Contract Reform Team also recognizes that, given the need to maintain and increase partnerships with the private sector, the Department will continue to contract for management services at many of its facilities and laboratories. The Department, like much of the federal government, can benefit significantly from the use of top management expertise from the private sector to execute and implement the programs and policies designed by DOE officials and managers.

The Department will use a new Performance-Based Management Contract when necessary to contract for management and operating services in whole or in part on a cost-reimbursement basis. The key elements of the new Performance-Based Management Contract are listed on the following page.

The Performance-Based Management Contract principally will be a management contract, designed to retain the talents of the private sector in integrating the efficient operation of a site or facility, with no presumption that the contractor will itself handle any or all of the site operations. In this regard, other recommendations in this report—for example, greater use of fixed-price contracting, increased competition, and detailed "make-or-buy" plans—should ensure that the new Performance-Based Management Contract clearly sets out the Department's expectations, rewards superior performance, and minimizes costs to the government.

This section of the report proposes the Performance-Based Management Contract

Key Elements of Performance-Based Management Contracts

- Clearly stated, results-oriented, performance criteria and measures.
- Appropriate incentives for contractors to meet and exceed the performance criteria effectively and efficiently.
- Appropriate criteria and incentives for contractors to seek opportunities to subcontract for tasks that may be effectively and efficiently performed directly by private firms other than the management contractor.
- Specific incentives for cost savings.
- Improved financial accountability.

as a substitute for the traditional M&O contract. However, the contracting tools recommended for use in DOE's management contracts, in particular the specific performance criteria and measures, are equally valuable for use in all of DOE's contracts.

Performance Criteria and Measures

The development of clearly stated, results-oriented performance criteria and measures is the cornerstone of the Contract Reform Team's recommendations. These criteria and measures should address three principal areas:

- Performance of the DOE program tasks that are the subject of the contract.
- Performance of business management, financial management, and accounting tasks (including management of human resources and actions to increase public trust and confidence).
- Performance of environmental, health, and safety tasks.

The criteria and measures should be periodically reviewed, updated, and validated at appropriate levels of the Department.

Appendices F through K provide detailed examples of the types of performance criteria and measures that the Department is developing in each of these areas. Just because they are at the back of this report does not mean they are unimportant. To the contrary, the work of refining the performance criteria and measures—with congressional and stakeholder input—will be critical to the success of the Department's contract reform effort.

Action: *Develop programmatic performance criteria and measures.*

Each of the Department's four major program areas (Scientific Research, Applied Technology, Defense Programs, and Environmental Restoration and Waste Management) has formulated strategic goals and mission statements as part of the Department's Total Quality Management Initiative. The Department's program offices are translating their strategic goals into specific programmatic goals and objectives that in turn are being reduced to criteria for measuring the performance of DOE programs. Appropriate measures will be specified in contracts in each DOE program area.

The performance criteria and measures

resulting from this effort ought to be applied to DOE programs and operations, as well as to its contractors. The Secretary and Deputy Secretary intend to measure the performance of each of the program areas using similar performance measures. Ultimately, measuring the program areas and the contractors by similar quantifiable criteria should assist the Department and its contractors to align their objectives. This approach could result in a true partnership between the Department and private-sector and academic enterprises, with each having the maximum incentive to accentuate activities that add the most value to their highest, measured priority.

Ultimately, measuring the program areas and the contractors by similar quantifiable criteria should assist the Department and its contractors to align their objectives. This approach could result in a true partnership between the Department and private-sector and academic enterprises, with each having the maximum incentive to accentuate activities that add the most value to their highest, measured priority.

The following paragraphs summarize performance criteria and measures appropriate for each of the four basic DOE program areas.

- **Scientific Research** encompasses basic and applied scientific research traditionally done by government or universities. The performance criteria for this program area will address such matters as the quality of the basic science, the relevance of the science to the Department's missions, the construction and operation of research facilities that meet the government's needs, and the effectiveness and efficiency of research program management. Performance in these areas can be measured, for example, by using independent peer review groups chosen by the Department. These groups should also be tasked to evaluate scientific programs and to assist the Department in prioritizing them in rank order to reflect the Department's missions. As in the other program areas, the performance criteria should also be based on important policy priorities, such as relevant environmental, health, and safety principles.

The Department of Energy is not the only research organization that is refining its performance measures. American private industry itself has taken great strides in the last 10 years in reorganizing its research and development functions and engaging in strategic planning. In the last decade, the largest American firms doing basic research and development have shifted the decisions concerning how much research and development to buy from company headquarters to operating divisions.

- **Applied Technology** refers to the many areas of scientific research intended to have near-term commercial applications. The Department's energy, defense, and environmental programs are all engaged in research that may have commercial applications. The types of performance criteria in this area are likely to be similar to those used in a conventional commercial research and development department, such as the value of patent rights, the number of cooperative research agreements, and the ability to attract industrial partners for cost-shared projects.

- **Defense Programs** include the Department's national security missions, such as maintaining stewardship of the nation's nuclear stockpile. A strategic planning process within the defense programs area has resulted in a restatement of missions that will become the basis for performance criteria. The current defense missions range from effective drawdown and disposition of obsolete facilities to maintaining essential science and technology infrastructure and core competencies. Performance criteria in this area would include, for example, responsiveness to national security requirements and improved program management of drawdown and disposition operations. These criteria could be measured, for example, by improvement in nuclear sensor and search capability, and measured reduction in the costs of disassembling a weapon.

- **Environmental Restoration and Waste Management** programs include the safe management of waste and the restoration of contaminated sites and facilities. For these tasks, performance criteria will include reducing environmental risks and hazards at Departmental facilities and preventing new environmental damage. As the program matures, more specificity in the nature of the underlying activities will permit the greater use of performance criteria and measures, with accountability at the project level.

DOE's Office of Environmental Restoration and Waste Management (EM) recently conducted a performance measurements study of DOE sites engaged in cleanup and waste management construction projects. The results have prompted specific Departmental initiatives to improve the productivity of EM's project management systems to bring them in line with or to surpass the performance of other federal agencies and the private sector Appendix E highlights the findings and recommendations of the study. Implementation of these recommendations will be an important part of contract reform.[14]

Action: ***Develop business management performance criteria and measures.***

In addition to the performance criteria and measures specific to each of the four program areas, the new Performance-Based Management Contract should include criteria and measures encompassing business management activities essential to the contractor's management of the Department's sites and facilities. Included are systems for the effective management of costs, personal and real property, and human resources; innovative management practices; responsiveness to stakeholder concerns; compliance with applicable laws and regulations; and timely implementation of contract commitments. DOE has already established some business management performance criteria to be incorporated into contracts. Appendix J sets forth examples of these criteria.

Action: ***Develop performance criteria and measures for securing superior environment, safety, and health performance.***

The Baldridge Award criteria and the Occupational Safety and Health Administration's Voluntary Protection Program guidelines provide examples of recognized practices that promote the involvement of workers and their representatives in the process of securing a safe work environment. Additionally, the Environmental Protection Agency's Federal Government

Challenge Program seeks from federal agencies agreement to a code of environmental principles that emphasizes pollution prevention, sustainable development, and state-of-the-art environmental programs. The Department should examine these programs in developing environment, safety, and health performance criteria and measures for its contracts.

In addition, the Department's clear commitment to meet labor, community, safety, security, and environmental requirements must be implemented by requiring contractors to develop strategic plans and program/project implementation plans. This requirement must be reflected in the performance criteria developed for DOE's contracts. The Health and Safety Plan required by DOE's present contracting procedures should be modified to provide explicitly for worker involvement and the rights of workers to shut down unsafe operations and to refuse to perform manifestly dangerous work.

Performance criteria also should reflect the need for continued assessments of performance in accordance with a contractor's strategic plan and periodic revisions of the plan to meet changing circumstances. This is especially important in the environmental cleanup area, where surprises are common and environment, safety, and health needs are subject to continual change.

Action: *Establish procedures for the development and use of performance criteria and measures.*

The Department of Energy must establish procedures (including key organizational roles) for Departmental personnel to:

- Develop contract performance criteria and measures.
- Incorporate performance criteria and measures in contracts.
- Assign near-term and long-term actions for implementing a contract performance measures system (including methods for collecting performance measures results).
- Make these performance standards consistent with those applied to Department program offices by the Secretary and Deputy Secretary in periodic program reviews.

There are significant communication gaps and lack of coordination between the Departmental program offices that select research tasks and priorities, the various Field Operations Offices that manage contractors on a daily basis, and Department Headquarters elements that authorize contracts and make disbursements. In addition, the procurement process itself is too cumbersome. It does not allow program and project managers to shift work from contractor to contractor swiftly based upon such factors as poor performance of the existing contractor or availability of a superior contractor.

Action: *Train DOE program personnel in performance-based contracting.*

Contracting for performance will require a radical change in the teams assigned to negotiate contracts, select contractors, manage contracts, and determine fees. To implement performance-based contracting effectively, DOE Headquarters and Field program managers need to be trained.

DOE will develop a training program that focuses on performance-based contracting methods, statement of work preparation, and proper management of contractors.

Additionally, the Department personnel who will be assigned responsibility for evaluating contractor performance must receive appropriate training and technical resources to conduct effective and meaningful evaluations. The training programs will emphasize cost-cutting, appropriate work definition, elimination of excessive contract tasking, maximum efficiency in the use of contractor staff resources, and measurement of contract performance.

Converting to a performance-based management approach to contracting will be a difficult task within DOE, given the need for a reorientation of performance expectations in light of historical biases and resistance to change. Achieving the necessary reforms also will be complicated by an overall federal procurement process that often imposes cumbersome requirements that tend to delay contract actions and increase contractor costs. However, the reforms can and must be implemented successfully over the next few years.

Incentives for Contractor Performance

A critical component of the new Performance-Based Management Contract concept is the design of proper incentives to reward superior performance and discourage substandard performance. The Department should reward cost-effectiveness, superior technical performance, and overall management excellence. Strong incentives need to be fashioned to encourage achievement of the stated performance requirements.

The Department's system of incentives for its contractors must be revised to provide more effective rewards for excellent performance and to compensate the contractors more appropriately for assuming financial risks. Given the unique research-orientation and academic environment of many of DOE's facilities, financial incentives are often not as important to contractors as recognition for scientific achievements and enhanced research funding. DOE's incentive structure, therefore, also must incorporate these nonpecuniary rewards.

Further, given the diverse functions currently performed under most M&O contracts, it may be appropriate for new contracts under the Performance-Based Management approach to include multiple-incentive arrangements.

> The Department should reward cost effectiveness, superior technical performance, and overall management excellence.

Action: ***Create and implement tailored incentives for Performance-Based Management Contracts.***

The Department of Energy should consider including the following types of incentives[15] in Performance-Based Management Contracts.

- **Cost Incentives**. The Department should design a cost-incentive fee approach in which cost baselines are set and contractor compensation is tied to the baselines.[16] Cost incentives should be particularly useful for project-oriented tasks. Cost-incentive provisions include a target cost, a target profit or fee, and a profit/fee adjustment formula that (within specified limits) provides that contractors receive (1) the target fee if actual costs meet target costs; (2) a downward adjustment of the target fee if actual costs exceed target costs; and (3) an upward adjustment of the target fee if actual costs are below target osts.

- **Technical Performance, Delivery, and Schedule Incentives**. Because of the interdependency of cost, technical performance, and delivery goals, a contract that focuses only on one incentive goal may jeopardize achievement of the others.[17] The new Performance-Based Management Contract also should include technical, delivery, and other schedule-related (milestones) performance incentives.

- **Future Budget Allocations**. DOE should establish an explicit policy of considering a contractor's past performance in determining the contractor's future scope of work and budget allocations under cost-reimbursement contracts. Contractors with superior performance could receive increased work and budget allocations, and allocations to contractors with inferior performance could be decreased. The Department of Defense has used this policy to promote competition among contractors.

  Obviously, the implementation of this recommendation will require careful consideration of a number of concerns—for example, the practicality of the Department's trying to shift tasks between contractors from year to year and the cost of shifting activities from facility to facility. Nevertheless, development of a plan to permit program managers to shift work more easily among contractors and facilities is critical to lowering costs by creating competition among contractors.

- **LDRD Allocations**. Laboratory Directed Research and Development[18] (LDRD) is recognized as essential to the future of any research laboratory and is a benefit to the Department of Energy. LDRD allocations in contracts provide flexibility to fund new ideas as they arise. It is a key ingredient to maintaining the health and vitality of a laboratory.

  Laboratory directors value LDRD, and it should be used as an incentive to improve overall performance. Each year, the Department should consider the performance of the laboratory in deciding on the appropriate amount of LDRD funding to allow. In addition, in the case of nonprofit laboratories, the Department should consider substituting an additional LDRD allocation for the performance-based management fee.

- **Bonus Based on Ranking Relative to Other Contractors.** The Department's current method of administering fees does not take into account a contractor's performance relative to other contractors working in comparable program areas. An incentive mechanism based on some kind of cross-cutting ranking could be helpful in: accomplishing goals based more on performance than on the total amount of the contract; encouraging use of more objective criteria that can be understood across program lines instead of substantial reliance on subjective evaluations made by Departmental operations offices; and improving performance through greater competition among existing Departmental contractors.

- **Linking Contract Duration and Extension to Performance.** The Department should explore and test the feasibility of contractual provisions that reward superior performance with extension of the term of the contract and deter substandard performance with reduction of the term of the contract.[19]

Action: ***Establish an appropriate management fee policy for nonprofits.***

In fashioning performance incentives, the Department's relationship with universities, research institutes, and other nonprofit organizations requires special focus. Of the 52 current M&O contracts within DOE,[20] 18 are with 14 different nonprofit organizations, including 10 academic institutions or consortia of such institutions. All of the 18 nonprofit management contractors operate DOE research and development laboratories. The research ranges from the most basic studies of the ultimate constituents of matter to the discovery and advancement of new, breakthrough technologies. These technologies include those dealing with energy, high-performance computing, global climate change, biotechnology, advanced manufacturing, materials, and the environment. These laboratories often have produced outstanding results, as reflected by the numerous Nobel prizes awarded to their scientists and numbers of Cooperative Research and Development Agreements and licenses.

In developing an appropriate management fee policy for nonprofits, DOE should recognize that a major motivator for most nonprofit contractors is recognition in the scientific and academic communities. For example, effective operation of a national laboratory by a university affects that university's ability to attract the best students and academic researchers and to obtain grants that help build the university's own infrastructure.

Management fees also serve as an incentive. The Department's policy has been not to pay management fees to nonprofit educational institutions.[21] The Department should change this policy so as to generally permit the payment of a management fee to nonprofits, where they are subject to the same cost-reimbursement rules as for-profit contractors.[22] The management fee would vary with the magnitude and complexity of the work under the contracts (as currently is the case for management fees payable to profit-making firms), and contain a component to compensate the contractor for any increased financial risk. In determining the level of the fee, DOE should consider, among other things, the tax status of the nonprofit organization, so that lesser fees are paid to tax-exempt organizations. Additionally, the development of a fee and risk-sharing policy for nonprofit contractors should address the special concerns of nonprofits with respect to protecting university endowments and preserving limited assets.

Finally, if the Department implements the Department-wide performance ranking and future funding and budget allocation incentive policies discussed in this report, they also could be applied to nonprofit contractors. It is important to emphasize that a later section of this report recommends that nonprofits be held to the same controls on cost reimbursement as profit-making institutions. Thus, while nonprofits might now receive management fees for their work, reimbursement of their costs—including fines and penalties—will now be more carefully monitored and controlled than in the past. In this way, the Department will more rationally balance risk and reward in the activities of nonprofits.

Action: ***Establish compensation incentives for senior nonprofit laboratory personnel.***

Establishing financial incentives for senior nonprofit laboratory personnel based on performance measures in the contract will help enforce the Department's performance and cost priorities. For example, a laboratory's performance could be measured against specific performance criteria, and a predetermined multiplier could be applied to calculate the annual salary increase fund for the laboratory's senior managers. This concept, when coupled with an effective performance appraisal system linked to merit pay, can help establish accountability by the laboratories.

> ***"Effective, entrepreneurial governments transform their cultures by decentralizing authority. They empower those who work on the frontlines to make more of their own decisions and solve more of their own problems. They embrace labor-management cooperation, provide training and other tools employees need to be effective, and humanize the workplace. While stripping away layers and empowering frontline employees, they hold organizations accountable for producing results."***
>
> **Report of the**
> **National Performance Review**

Special Incentives for Reducing Contract Costs

Often, contractors who manage the Department's facilities and production sites, including their employees at all levels, are in the best position to identify how to streamline and cut costs. However, under the Department's current award fee structure, contractors are not sufficiently motivated to identify cost-reduction or cost-avoidance approaches and apply them to their operations. The award-fee system used under many of the traditional M&O contracts is structured so that a poor rating in one area of measurement can offset positive ratings in all other areas of performance. To overcome this problem, the Department should develop incentive programs outside of the award fee structure to motivate the contractor to reduce or avoid costs without degrading performance.

Action: ***Develop a DOE-wide incentive program for contractor cost-reduction/cost-avoidance programs.***

Currently, three DOE operations offices—Rocky Flats, Savannah River, and Idaho—use cost-reduction/cost-avoidance programs in their contracts. A key component of the programs allows the contractor to share in the savings realized by the Department through the adoption of valid contractor proposals. Although the programs used by the three offices differ, they have resulted in approximately $150 million in savings during the last two years.

The Department should develop standardized tools to motivate contractors to employ innovative business practices and techniques to reduce or avoid costs associated with contract performance. Similarly, developing ways to share costs with contractors will provide a substantial incentive for contractors to treat government dollars as they would their own and create a market-based incentive for cost reduction. Use of market-based incentives rather than contract mandates is a hallmark of the concept of reinventing government, as articulated in the National Performance Review. This type of incentive is discussed in greater detail below. A management contractor's willingness to include such incentives in its contract with the Department should be a material consideration in determining the ranking given a contractor's offer in the competitive selection process.

Contractors should be allowed to share in any hard-dollar savings realized. Each contractor also should be expected to develop a system of cost-saving incentives for its employees. In addition, Department contractors should be evaluated on their ability to substantially reduce middle management and expand the span of supervisory control across all employee ranks, while maintaining superior contract performance. The Department must also develop greater expertise in cost estimation as a managerial control. Reliable cost estimates are an essential element of giving contractors an incentive to cut costs.

In establishing its cost-saving incentives program, the Department should:

- Consider the experiences of existing programs.
- Establish proper baselines and cost measurement tools to ensure that estimated savings are actually achieved.
- Provide training for Departmental personnel responsible for evaluating contractor proposals.

An analogous government-wide program, known as Value Engineering, already exists for Federal Acquisition Regulation contracts, and provides a model that could be considered in developing a DOE-wide approach.[23]

Action: *Use cost-sharing arrangements in Performance-Based Management Contracts.*

There is often a congruence of interests between the Department and a contractor that manages and operates a DOE laboratory or facility. The research and development and other industrial processes conducted at the DOE facilities may offer present and future technical and economic benefits to a contractor beyond the immediate contract. These real technical and monetary benefits argue strongly for the Department and the contractor to share the benefits and results associated with such activities. Therefore, the Department should actively explore joint ventures or other cost-sharing arrangements with contractors.[24] These arrangements may be especially suitable in such areas as scientific and applied research and development of technology.

Action: *Use multiple-fee arrangements in Performance-Based Management Contracts.*

The use of multiple-fee arrangements within a single contract may be more effective than a single-fee structure in creating incentives for superior contractor performance. Under this concept, the most appropriate fee mechanism would be applied to discrete activities and functions performed by a contractor.

For example, a Performance-Based Management Contract for a large, multiprogram site may have fixed-fee, incentive-fee, award-fee, and possibly even fixed-price provisions geared to driving outputs and results. Routine activities, such as cafeteria and housekeeping services, could be subject to a firm, fixed-price or cost-plus-fixed-fee arrangement. In other cases, such as technology development, where the qualitative aspects of technical, schedule, and cost performance are important, the contractor could be subject to an incentive or award fee arrangement.

Special Incentives for Environment, Safety, and Health Performance

DOE's current contracts do not provide incentives to prevent environment, health and safety problems before they occur. Contracts should include incentives that reward a contractor who, for example, successfully implements a pollution prevention activity that eliminates or reduces a waste stream and the attendant waste management costs.

Action: ***Develop incentives for environment, safety, and health risk-prevention programs.***

The Department should include provisions in all contracts to encourage participatory management by workers on environment, safety, and health, to the extent permitted by law. Likewise, a clause is needed to require that environment, safety, and health implementation plans meet applicable laws and requirements at the least overall cost to the government and to hold the contractor accountable for implementation of the plan.[25]

Explicit encouragement of preventive actions occurs through a four-pronged effort:

- Link the environment, safety, and health program and budget planning process and management commitment to the contractor's fee.
- Reward contractors for reductions in DOE-targeted risks—for example, meeting the Department's pollution prevention and reduction goals.
- Provide cost-saving incentives to contractors who reduce the costs for environment, safety, and health programs while meeting commitments and demonstrating continuous performance improvement.
- Encourage contractors to establish systems to pass on incentive payments to the responsible employees.

Making Cost-Effective "Make-or-Buy" Decisions

The DOE and its management contractors should make more rational decisions concerning whether management contractors "make" or "buy" the services required by a project or program. The requirement to be more cost-effective and to be consistent with long-term strategic objectives for DOE's programs should drive such decisions. In this regard, "make" is defined as those programs, operations, goods, and services that are performed within the Departmental complex directly by the employees of a particular management contractor. "Buy" refers to those that are purchased directly by the Department or by the management contractor responsible for the program or project, including subcontracts and other prime federal contracts.

Numerous opportunities exist to "buy" from commercial sources in the private sector many of the direct program operations, technology programs, infrastructure, landlord, and support activities that are currently performed by employees of management contractors. Increased "buying" of selected services by the Department's management contractors has been occurring throughout the DOE complex (for example, waste treatment, fleet maintenance, laundry services, cafeteria operations, groundskeeping, and computer equipment and services). The Department, however, can make more explicit and cost-effective, make-or-buy decisions. Much can be accomplished through a formal and aggressive Department-wide make-or-buy effort that will result in enhanced commercialization of technologies and more cost-efficient operations.

There appear to be three principal obstacles to a rationalized process for deciding whether the activities of a particular management contractor should be performed by that contractor.

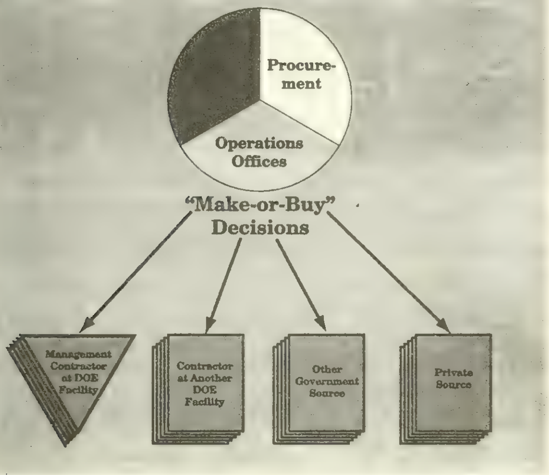
- Management contractors' fee structures may create distorted incentives for contractors to increase the scale of their operations.
- The delays and costs of the current procurement system slow down the process of bringing in new parties to do part of the work, so that it is easier and quicker to simply expand the activities of a current management contractor.
- The practice of cost reimbursement for overhead items without adequate managerial tools to eliminate layering overhead may cause the government to pay excessive duplicative overhead for subcontractors.

Careful planning should allow each of these obstacles to be overcome.

Figure 3 portrays the recommended model for the Department's "make-or-buy" strategy. It schematically depicts the three major organizations within the DOE com-

Figure 3

Department Decides to "Make-or-Buy"



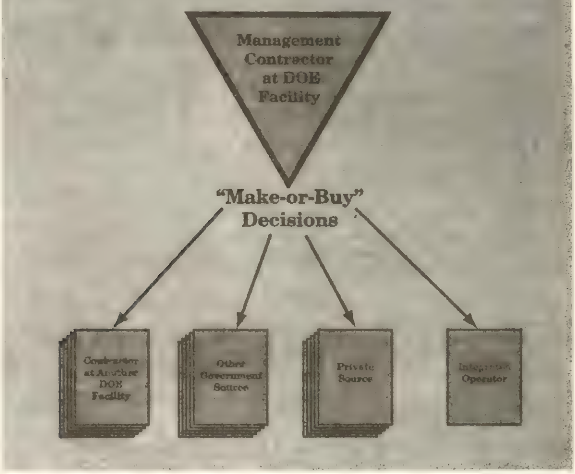
plex that have significant make-or-buy opportunities. Figure 4 portrays the choices available to DOE's management contractors.

Action: ***Obtain quality performance at the least cost, consistent with Departmentally approved, program-specific factors.***

The Department's make-or-buy decisions should balance least-cost and program-specific considerations. For example, DOE should establish a general preference for contractors to "buy" various nonprogrammatic "indirect-cost" functions, such as laundry and cafeteria services, unless the management contractor can perform at a lower cost or other overriding "make" reasons are documented. Exercising a preference to "buy" indirect-cost services when they are available at a lower cost represents a significant and important change in DOE contracting practices.

Figure 4

Management Contractor Decides to "Make-or-Buy"



For the Department's applied technology activities that support some strategic goal in the marketplace, such as energy-efficient technologies, the "buy" decision also should be the common path for program deployment. These applied technology programs are unique among the Department's programs in that their primary objectives cannot be achieved without the private sector's taking the lead on issues of commercial applications, market opportunities, and economic requirements.

For placement of "new" work, DOE should survey the marketplace to ensure effective program development, have a solid baseline of the private sector's capability, and determine where the management contractor can best serve the Department's objectives. If the work can best be performed by the existing contractor, then the work should be placed with that contractor. If the capability is generally available within the private sector or another DOE or other government facility, the decision should be to "buy" that work, unless outside placement of the work is restricted by any other Departmental program factors, such as preservation of a unique technology source, national security, exigency, or maintenance of core-competency support or essential defense capability.[26]

A transition to a more rational make-or-buy approach to new research and projects cannot happen overnight. Maintenance of certain core competencies within Departmental laboratories is essential to preserve scientific capabilities needed, for example, for defense capability.

Action: ***Require management contractors to prepare "make-or-buy" plans.***

Current Departmental procedures tend to bias contractors to perform various operations themselves. Under the present structure, a contractor must obtain prior DOE approval before it decides to "buy" above certain dollar thresholds. In contrast, where the decision is to perform this work within the contractor's organization, there is no consistent, prior scrutiny by DOE Field or Headquarters personnel.

Detailed "make-or-buy" plans should be prepared that would clearly set forth the areas and actions that each contractor proposes to take in operating the site/facility on a least-cost basis, subject to program-specific guidance on program policy factors that are to be applied to the make-or-buy decision matrix. Once approved, these plans will be incorporated into the contract (and updated as necessary), together with appropriate incentives, and the contractor's performance will be evaluated on meeting or exceeding the agreed-upon expectations.

Action: ***Contract for routine services at the lowest practicable cost.***

Routine services, such as landlord functions, generally should be performed using the least-cost method. In general, these types of routine services should be obtained from the least-cost source consistent with applicable labor laws and regulations and collective bargaining agreements. When the contractor is charged with overall site management responsibilities, the contract should clearly require performance of routine functions by the lowest-cost means available to obtain the agency's requirements.

For work that is currently being performed by a management contractor, DOE must determine whether any restrictions exist (including such factors as sole-source capability, national security, maintenance of core defense capability, and continuity of research effort) that warrant retention of the work with the current performer. Barring any such restrictions, the work should be placed with the organization likely to offer the best value at the least cost.

Finally, DOE must consider the potential for negative impacts on existing contractors' workforces in a transition from a "make" to a "buy" decision, and should structure a plan to minimize any such impacts. Specifically, the Department will ensure that actions resulting in workforce displacements comply with all applicable requirements of Section 3161 of the Defense Authorization Act of 1992.

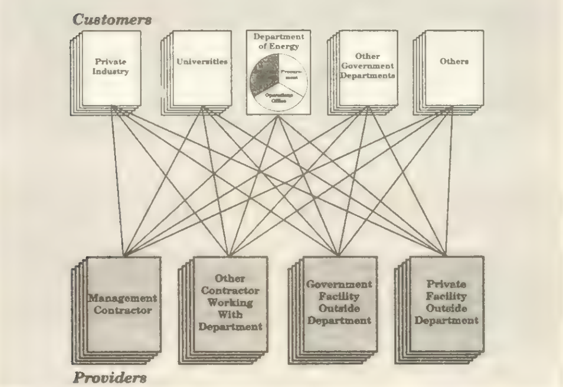
Increasing Competition to Improve Performance

The Department's M&O contracts[27] typically have a term of five years. For many reasons, including the close working relationships between the Department and its contractors, as well as the complex and time-consuming procurement process, the Department typically has extended these contracts for successive five-year periods. This practice has resulted in many contractors continuing to perform for decades.[28]

In determining whether a current contract should be competed or extended, DOE assesses the contractor's performance and considers, among other things, the likelihood that other qualified firms or organizations will compete for the contract (Figure 5) and

Figure 5

Various Providers Have Other Customers


Customers
Private Industry
Universities
Department of Energy
Procurement
Operations Office
Other Government Departments
Others
Management Contractor
Other Contractor Working With Department
Government Facility Outside Department
Private Facility Outside Department
Providers

whether seeking competition would meaningfully improve performance or cost.[29] In addition, under the current practice, DOE makes the decision to extend an existing management contract prior to negotiation of the new contract terms. The extend/compete process typically begins about 18 months before the date of contract expiration.

The current process needs revamping. Specifically, establishing a policy in favor of competition versus extension would encourage new bidders to participate, result in continuous improvement in performance, eliminate the prejudice toward incumbency, and preserve the concept of an enduring relationship between the Department and its contractors by allowing for—but not guaranteeing—one contract extension.

In addition, DOE must change the evaluation criteria it uses for selecting its contractors. DOE needs to adopt a strategy for selecting contractors that encourages more companies to compete and attracts the very best management expertise to the Department's laboratories and production facilities. Part of this strategy should consider ways to increase small business and minority contractor participation.

When evaluating the experience and performance of potential management contractors, the Department's practice has been to use criteria that include demonstrated competence and experience in managing and operating programs and facilities similar to certain specialized Departmental laboratories and production facilities (for example, reactor operations, weapons production and testing, and spent fuel processing). This practice may discourage some firms from competing on Department work, and may thereby prevent the Department from tapping the innovation and creativity of the very best private-sector managers. In addition, these criteria encourage firms responding to the Department's solicitations to propose similar, narrowly focused management approaches, rather than to demonstrate innovation and flexibility. The Department should consider the overall quality of a contractor's performance of nonfederal work in choosing new contractors.

The current process needs revamping. Specifically, establishing a policy in favor of competition versus extension would encourage new bidders to participate, result in continuous improvement in performance, eliminate the prejudice toward incumbency, and preserve the concept of an enduring relationship between the Department and its contractors by allowing for—but not guaranteeing—one contract extension.

Action: ***Except in unusual circumstances, automatically compete management contracts after no more than one extension.***

Adopting a new orientation to the extend/compete process that favors competition over extension will eliminate the current bias within DOE toward incumbency. This new policy to permit only one 5-year extension to a contract (that is, having contractor tenures of no more than 10 years before the contract must be competed) benefits DOE in several ways:

- New firms would be encouraged to participate in the contracting process because potential competitors understand that an incumbent contractor does not have a perpetual relationship with the Department.

- Contractor performance would improve because a contractor would understand that the quality of its overall performance will be a pivotal consideration not only at the time of the first extend/compete decision, but also in any subsequent competitive procurement.

- DOE's acquisition planning activities will improve because competition will be institutionalized within DOE. Under this policy, the procurement cycle will operate on either a 5- or 10-year cycle.

- By permitting long-term contractual relationships of up to 10 years, DOE can realize the benefits that superior contractor performance provides to the continuity and success of mission-related and scientific programs. In addition, this approach provides industry and academia with assurances that DOE recognizes the complexity of the contractual effort and the magnitude of the resources needed to perform.

In exceptional circumstances, there may be compelling programmatic reasons for extending a contract beyond the 10-year limitation established by this new policy. Such rare cases will necessitate a determination by the Secretary of Energy that no viable alternative sources are available to perform the contract.

Action: ***Negotiate the terms of the extended contract before making the extend decision, and make the decision-making process open to public scrutiny.***

Currently, the Department makes a decision to extend a contract before it negotiates the terms of a renewal contract, greatly reducing its leverage during the negotiation process. This practice should end. In addition, the decision-making process to determine whether to extend or compete a contract should be made more transparent, so that stakeholders have an opportunity to voice their views regarding the contractor's performance.

Action: ***Develop evaluation and selection criteria that increase competition.***

In the face of changing priorities and funding constraints, DOE needs to encourage participation by contractors with proven managerial experience whether or not they have prior DOE experience. The Department needs to develop new criteria that attract the interest of new entities for managing DOE facilities. When selecting contractors, the Department also should consider entrepreneurial expertise; corporate vision for managerial and technological innovations; capability to increase technology development and transfer; innovation in the cost-effective use of resources; capability to identify, and demonstrated experience in implementing, innovative approaches; environmental, safety, and health expertise; and a proven track record in support of small and minority business goals.

When DOE determines that an existing contract should be extended, the incumbent contractor should be required to submit a proposal addressing these criteria as part of the selection process. Appendix L of this report provides additional examples of the types of factors that should be considered under these evaluation and selection criteria. While implementing the new contracting strategies in this report will help increase competition,[30] additional internal and external barriers will require further examination, analysis, and action. The Department needs to assume a leadership role in generating greater competition.

Streamlining the Procurement Process

One frequently cited inhibitor to competition is the procurement process itself. Common complaints are that the process is too cumbersome, costly, time-consuming, and litigation-prone. For example, a contract for services costing in excess of $10 million typically takes 16 to 24 months to compete. In extremely large dollar-value procurements, firms can spend in excess of $1 million in preparing their offers. Even lower-dollar acquisitions can take months. At a stakeholder meeting in New Mexico, one small business executive related his firm's contracting history with DOE and stated that, when it became clear that the firm's proposal preparation costs exceeded his profit margin, he decided not to compete.

> *"Cutting red tape, organizing services around customers, and creating competition will start to generate an environment that rewards success. Now, we must encourage those within government to change their ways. We must create a culture of public entrepreneurship."*
>
> Report of the
> National Performace Review

DOE's internal processes and procedures needlessly extend the time required to award a contract and provide little or no added value to the quality of the contract. For example, the Department has established dollar thresholds over which contracts awarded by its operations offices must be reviewed and approved before the actual award can be made.

Action: ***Create a Procurement System Improvement Task Force to evaluate and streamline the Department's procurement process.***

The Department will establish a cross-cutting group to focus on streamlining the Department's procurement process. This group will use a total quality management mapping approach to identify, examine, and recommend revisions of the process. Within DOE, internal processes and procedures exist which needlessly extend the time required to award a contract and provide little or no added value to the quality of the contract. For example, the Department has established dollar thresholds over which contracts awarded by its Operations Offices must be reviewed and approved before the actual award can be made. The Department should review these thresholds and other similar controls to determine their need and value. The task force also will emphasize enhancing the opportunities afforded small and minority businesses, and will recommend legislative changes, when necessary.

Notwithstanding the existence of internally established processes that are candidates for streamlining, the procurement process also is largely a product of external measures over which the Department has little independent control. These measures include certain features of the Competition in Contracting Act, the Federal Acquisition Regulation, and a myriad of other procurement-related statutes and regulations. However, as evidenced by the Report of the Department of Defense Acquisition Law Advisory Panel[31] and the National Performance Review, actions are underway across government to "reinvent" the way the government conducts its contracting activities. Significant recommendations include creating a new "simplified acquisition threshold" of $100,000 and enhancing the purchase of commercial products. The Department supports these efforts, and plans to assume a leadership role in pursuing the streamlining goals. A critical role of the DOE task force will be to identify opportunities for DOE to participate in government-wide activities relating to procurement improvement.

Reducing the Use of Contracts for Support Services

In the past 13 years, DOE annual expenditures for support services have increased from $88 million to $768 million, as the Department's total budget grew from $15.4 billion (1980) to $23 billion (1993). In part, this trend reflects the need to obtain new specialized expertise as the Department's mission has changed. However, this increasing reliance on contractors to accomplish the priorities and mission of the Department has raised a number of concerns, including whether: (1) the use of cost-reimbursement contracts is the most cost-effective way to acquire these services; (2) these contractors are performing inherently governmental functions; and (3) these contracts are well-managed.[32]

DOE awards most contracts for technical and management support services on a cost-reimbursement, fixed-fee basis, under which contractor performance is initiated through the issuance of discrete work assignments. This approach provides flexibility to meet unplanned, but immediate, needs in program areas. However, costs frequently exceed original contract estimates, primarily because of poor definition of program requirements, overly broad statements of work, and the underestimation of contract hours.

Often, well-defined support service contracts may be the most cost-effective means of procuring expertise. In other cases, the growth of support services used on a routine and long-term basis simply highlights the need to change the mix of skills of DOE federal employees.[33]

> *"Every federal agency needs 'support services'—accounting, property management, payroll processing and legal advice and so on. Currently, most managers have little choice available in-house. But no manager should be confined to an agency monopoly. Nor should agencies provide services in-house unless the services can compete with those of other agencies and private companies."*
>
> Report of the
> National Performance Review

Most of the Department's support service contracts do not provide explicit incentives for quality performance and cost control. The contracts often combine in a single support service contract widely diverse requirements (for example, administrative and technical services, and/or recurring and non-recurring requirements). This practice inhibits development of a performance-based work statement, firm pricing arrangements, and objective performance measurements.

Action: *Identify DOE support services that can be cost-effectively performed by federal employees.*

The Department's Office of Environmental Restoration and Waste Management will convert 1,600 current contractor employees to federal employees over the next three years. They and other highly skilled employees in the Department will form the nucleus of an Environmental Management Service. This plan not only will enable the program to address growing management concerns but also is expected to result in a net savings of $188 million. This model should be expanded to other program offices.

Action: *Reduce support service contracting expenditures by at least 10 percent in Fiscal Years 1995–97.*

In May 1993, Secretary O'Leary challenged DOE's program offices to make at least a 10 percent decrease in support service contracting in Fiscal Year 1994. The program offices did so, and in fact the reduction will exceed that. The Department will realize a 12 percent reduction in support service dollars in Fiscal Year 1994, by spending $94 million less on support services than in Fiscal Year 1993 (Figure 6).

The Department will pursue additional reductions in future years by requiring each program office to develop a three-year plan to further reduce its use of support service contractors, as federal skills improve. This process will require program offices to examine the work of their support service contractors and identify contractor services that could be cost-effectively performed by federal employees. Appropriate consideration should be given to the impact that any further reductions would have on small and disadvantaged businesses. The feasibility of substituting federal employees for these functions will depend, of course, on the applicable federal policies that limit federal hiring flexibility, such as full-time-employee-equivalent ceilings and the availability of buyouts and other plans for voluntary retirements.

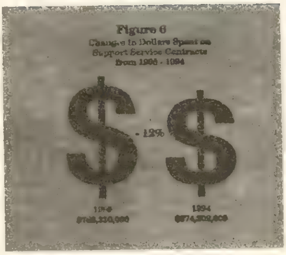


Figure 6
Changes in Dollars Spent on Support Service Contracts from 1993 - 1994

Action: *Implement performance-based contracting methods for support service contracts.*

The Department will develop a clear policy calling for the increased use of performance-based contracting methods. It will conduct a survey of current support services to identify types of requirements for conversion to performance-based contracting methods, placing particular emphasis on recurring requirements.

The Department's Savannah River Operations Office is conducting a pilot study to develop models for performance-based contracting methods for use in contracts for administrative support services ranging from clerical support and moving services to technical support. Information gained from the study will provide experience and insight in methods of (1) preparing completion-type statements of work, measurable quality assurance plans, and performance measurement criteria; and (2) developing positive and negative performance incentives. DOE will identify tools to assist in preparing the procurement package and in performing internal reviews of performance-based contracts.

III.

Improving DOE Management and Oversight of Contractors

In addition to improving its contracting practices, the Department must improve its management and oversight of contractors. This effort should focus on (1) strengthening financial and accounting systems; (2) improving the management of various categories of costs, including indirect costs; and (3) modifying and improving DOE's cost-reimbursement policies.

Strengthening Financial and Accounting Systems

The Office of the Chief Financial Officer (Chief Financial Officer) at DOE Headquarters and finance officers at DOE Field Offices are responsible for the Department's oversight of its contractors' financial management systems.[34] The Department inherited from its predecessor agencies a financial management process in which the Chief Financial Officer developed and maintained an integrated system of budgeting, accounting, and program cost reporting. With respect to financial information of management contractors, the Department treated contractors as subsidiaries, consolidating and reporting contractors' financial information without generating duplicate accounting records.

DOE also inherited contractor financial oversight procedures dependent on comprehensive field audits. The Department's Office of the Inspector General audits the Department's M&O contracts. The Defense Contract Audit Agency audits the Department's non-M&O contracts, as well as the contracts of the Department's M&O subcontractors. In addition, the Department uses the Voucher Accounting for Net Expenditures Accrued system, which requires contractors annually to prepare and certify that net expenditures accrued were in fact incurred and are allowable under their contracts. This system requires the Department's Inspector General periodically to examine the reliability of the internal controls used by contractors and DOE Field organizations, to ensure that only allowable costs are claimed and reimbursed.

FINANCIAL INFORMATION SYSTEMS

DOE's current information systems do not provide the kinds of data needed to manage contractors and programs effectively. The financial information gathering and reporting system used by the Chief Financial Officer is designed principally to report the financial condition of the Department, not measure program performance. While the Department gathers much information, relatively little of it can be used on a regular basis by senior managers, for example, to reduce overhead and overtime, or to analyze program accomplishments for dollars spent.

> *"Management isn't about guessing, it's about knowing. Those in positions of responsibility must have the information they need to make good decisions. Good managers have the right information at their fingertips. Poor managers don't."*
>
> Report of the
> National Performance Review

Action: ***Improve DOE's financial management information system.***

For financial and program managers to be accountable for program results and fiscally responsible for their resources, they must have adequate and accurate accounting information presented in a format that facilitates program analysis and cost control.

DOE program managers need more analytical financial information about contractors' performance. The information also needs to be reported consistently by each contractor program, so that program managers, as well as the Department, can compare contractor performance among sites.

Accordingly, the Department's Chief Financial Officer should meet with DOE program managers and other senior management officials to review and revise DOE's financial management information system, surveying systems currently in the public and private sectors. The revised system should ensure that the information being collected, disseminated, and reported for the benefit of program managers is consistent, useful, objective, timely, and accurate.

CONTRACTOR REVIEWS

DOE can free resources and reduce red tape by moving away from ad hoc reviews of its contractors, and creating real managerial information systems. The disallowance of costs already incurred is an inadequate management tool. Program officials should develop criteria on the reasonableness of costs based on their overall contribution to performance objectives, and contracting officials should scrutinize costs in relation to the value added to achievement of contract goals. Contractors should be expected to develop management systems that ensure that expenditures are reasonable and advance program goals. In addition, governmental reviews of operations offices and management contractors have increased significantly over the years. Many of these activities, however, are duplicative and not efficiently coordinated.[35] Meanwhile, the Department's management contractors often are required either by their contracts with the Department or by other non-Departmental institutional or legal requirements to perform internal audits and reviews that duplicate those performed by government officials.

Finally, staffing for contract administration, financial management oversight, and audit activities generally is inadequate in both DOE Headquarters and its Field Offices. The Department's Office of the Inspector General has acknowledged that it does not have the staff or resources to effectively audit the Department's management contracts. In addition, the Department's Field organizations responsible for financial oversight of management contractors are understaffed. The Defense Contract Audit Agency, which audits the Department's non-M&O contracts and its management contractors' subcontracts, also faces a substantial backlog of incurred-cost and close-out audits.

Action: ***Ensure that the Office of the Inspector General's audit goals place high priority on reviews and evaluations of contractors' financial management systems.***

Audits of contractors' allowable costs should focus primarily on the existence and implementation of sound contractor financial management systems, rather than on the multitude of individual contractor costs. In addition, the Department should establish reasonable thresholds below which extensive audit resolution processing is minimized.

Action: ***Develop Department-wide guidelines for the coordination of contractor oversight programs.***

DOE should develop guidelines to coordinate the timing and frequency of contractor oversight reviews. These guidelines should minimize and consolidate elective and discretionary reviews, and eliminate duplicative reviews. Reviews should be effectively coordinated at each Field activity, to minimize the burden on the contractor and interruption of ongoing contractor work.

Action: ***Explore alternatives to the use of the Voucher Accounting for Net Expenditures Accrued.***

The Voucher Accounting for Net Expenditures Accrued (VANEA) serves as the contractor's statement and certification that the net expenditures accrued in fact have been incurred and are allowable under the contract. Approval of a contractor's voucher by the Department's Office of the Inspector General, the head of the appropriate Departmental operations office or delegated procurement official, and the Field Chief Financial Officer constitutes an acknowledgment by the Department that the net costs incurred are allowable under the contract and that they have been recorded in the accounts maintained by the contractor in accordance with DOE accounting policies. Such approval, however, will not relieve the contractor of responsibility for DOE's assets under its care, for appropriate subsequent adjustments for unallowable costs, or for errors that later become known to DOE.

Contractor and Departmental resources used to certify contractors' annual voucher submitted under this audit system may be best spent on another form of financial report. The voucher itself is an ineffective management tool. However, the Office of the Inspector General's comments accompanying the certifications of the vouchers contain much useful information on the adequacy of a contractor's own internal accounting systems.

DOE should develop a new vehicle to replace this accounting process. The objective should be a comprehensive financial report, similar to the reports that managers in the private sector actually use to manage. Achieving this objective will depend in part on the availability of staffing, since both the Office of the Inspector General and the Chief Financial Officer currently are understaffed to perform their full responsibilities in light of the staffing restraints imposed by federal personnel ceilings.

Action: ***Evaluate increasing Departmental capability for review and audit of contracts and contractors.***

The Department's Office of the Inspector General has developed an audit strategy by which it and contractors' internal auditors coordinate the development of audit plans.[36] The objective of the strategy is to maximize audit coverage with existing resources and reduce duplicative or redundant audits. The contractors' auditors make their results available to the Office of the Inspector General for review. Based on its evaluation as to whether the contractor's internal auditors have complied with professional standards, the Office of the Inspector General may choose to use the work of the auditors as part of its basis for approving the voucher prepared by each contractor annually.

The Department's Office of the Inspector General and the Office of Management and Budget are cooperating in a review of the

Office of the Inspector General's auditing strategy. In this regard, in July 1992 the Senate Subcommittee on Oversight of Government Management issued a report entitled "Inadequate Federal Oversight of Federally Funded Research and Development Centers." This report was critical of the level of federal oversight of these centers, including DOE's administration of 20 research and development centers for which it has responsibility. In its report, the subcommittee raises concerns about the adequacy of the audit function and the audit approach that was in place at that time. The report included numerous recommendations for improving government management of the centers.

In one specific recommendation, the subcommittee report suggested that the Office of Management and Budget complete a study of the audit approach used by DOE. To this end, the Department's Office of the Inspector General provided a briefing to Contract Reform Team representatives, including those from the Office of Management and Budget, regarding the details of its Cooperative Audit Strategy. This presentation clarified a number of issues regarding the propriety and cost-effectiveness of the audit strategy, and the Office of the Inspector General has committed to working further with the Office of Management and Budget and the Senate Subcommittee staff to resolve any outstanding issues that the subcommittee may have.

Action: ***Provide the Defense Contract Audit Agency with the funding needed to eliminate audit backlog.***

DOE should expeditiously identify mechanisms to provide the Defense Contract Audit Agency with sufficient funding to permit additional resources to be assigned to audits relating to DOE's prime contracts (exclusive of the M&O contracts) and to M&O subcontracts. These mechanisms will serve to eliminate the current backlog in cost-incurred and close-out audits of these contracts and will substantially improve the ability of DOE's managers to administer financial operations. In establishing the incremental level of funding, the Department should prepare an assessment of (1) the extra costs to be incurred by the additional auditing resources, including the indirect costs incurred by contractors through additional audit compliance; and (2) savings generated by the audit.

DEPARTMENT PERSONNEL AND TRAINING

Because DOE's contracting practices historically have not required extensive contractor oversight, DOE lacks sufficient and adequately trained personnel in such areas as contract administration, cost estimation, and financial management.

Accordingly, under the leadership of Secretary O'Leary, the Department is in the process of expanding, training, and retraining its personnel. For example, DOE will expand its federal employment by over 1,000 new federal employees with improved basic skills needed to reduce costs and manage the Department's programs. This employment would be offset by a reduction of employment by contractors by at least the number of new federal employees. These employees will be part of an Environmental Management Service created within the Department. This service should be capable of establishing the spirit of cooperation and pride of accomplishment that has won recognition from time to time for such groups as the National Park Service staff and the staff of the Securities and Exchange Commission. Improved financial and managerial information systems and controls, however, are not simply a matter of more personnel. Many talented personnel already within the Department have had their efforts misdirected. For example, personnel in the Office of the Chief Financial Officer must gather data for different program offices in different forms. These personnel also generate many reports on an ad hoc basis, which requires significant additional effort in the collection of more original data. Creating a computerized, comprehensive data base would allow the Chief Financial Officer to generate reports in different formats from an existing comprehensive data base and would free a substantial number of employees to address other priority needs

Action: ***Train DOE managers to use integrated financial and managerial reporting systems effectively.***

Training Departmental managers to use an enhanced data collection system and comprehensive and flexible computerized data base system is an additional critical element in strengthening DOE's financial management systems. The Department will create a training program in a timely and effective manner to enable DOE employees to implement the enhanced financial information system.

Improving the Management of Particular Categories of Costs and Cost Controls

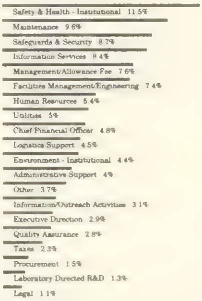
In addition to examining and improving its cost-reimbursement policies, DOE should improve the application of these policies with respect to specific categories of costs and cost controls.

INDIRECT COSTS

Certain costs associated with overall operation of a management contractor-operated DOE site are shared among the different Departmental programs operating at that site. These costs, while important to the overall success of the site operation and mission, are not related to specific core program objectives. They more closely resemble "General and Administrative" costs in the accounts of private corporations. As such, these costs are "indirect" to Departmental programs. Examples of such costs are security services, real estate and personal property management and maintenance, materials storage, and administration.[37] The Department incurred approximately $3.7 billion dollars in indirect costs in Fiscal Year 1993. Figure 7 shows the various categories of indirect costs and their respective percentages of the Department's total Fiscal Year 1993 indirect costs.

The management of contractor indirect costs requires the participation of a variety of DOE personnel. For example, Department Headquarters and Field Office financial managers have primary responsibility for defining, allocating, and reporting indirect costs. Program and project managers are responsible for determining the need for, and managing activities that generate, indirect costs. Recent DOE reviews of indirect cost control, however, suggest that program and project managers do not include indirect cost control as a major management objective.

Figure 7
Indirect Costs
(Percentage of Total FY93 Indirect Costs)



In this connection, on-site reviews of the management of indirect costs at Rocky Flats Field Office, Los Alamos National Laboratory, Oak Ridge National Laboratory, and Oak Ridge Operations/Y12 and analyses of responses to questionnaires from 23 other Field sites indicate that:

- DOE program managers are not adequately evaluating actual indirect cost requirements and effective options for satisfying those requirements.
- Many DOE program managers take the previous year's budget as a base, add escalation, then adjust costs to fit budget targets provided by Department Headquarters. Examining existing scope is sometimes included, but analysis of minimum sizing is seldom accomplished.
- Management control systems are in varying stages of development and implementation across the Department.

Action: ***Initiate Department-wide benchmarking of various indirect-cost categories against the best in class of public and private businesses, and initiate planning for specific goals for reducing indirect costs.***

The process for managing indirect costs should:

- Establish the policy that management and cost avoidance and/or savings of indirect costs should be the responsibility of DOE program/project managers as well as the financial managers.
- Give individual employees incentives to reduce indirect costs.
- Devise accounting systems as appropriate to compare the percentage of total costs attributable to indirect costs at various facilities and on various projects and programs to benchmarks inside and outside the federal government. In some cases, peculiarities of federal programs do not justify categories of indirect costs as a percentage of gross expenditures, or payroll costs that differ much from those encountered in the private sector. For example, benchmarks should be comparable between federal facilities and many private enterprises for cafeteria services, parking, routine security services, accounting services, payroll services, and the like. Benchmarks for other functions that have no parallel in the private sector might be best found at other governmental facilties. An example would be security for the nuclear weapons stockpile.
- Set goals during 1994, both by facility and by program, concerning the reduction in the percentages accounted for by various categories of indirect costs. Indirect costs should decrease as levels of supervision decrease and the scope of responsibility of individual supervisors increases.
- Revise current DOE Orders to emphasize the need for control of indirect costs.[38]

Environment, safety, and health costs have grown significantly. An aggressive implementation of improvements in environment, safety, and health activities is a high priority of the Department of Energy. Control of indirect costs could be used as an excuse to de-emphasize the accomplishment of environment, safety, and health goals. In some cases, the Department may need to continue to increase its expenditure of resources for environment, safety, and health.

As with other categories of indirect costs, environment, safety, health expenditures can be benchmarked against organizations that are the best in their class, or the facility most comparable to the Departmental facility being benchmarked. Benchmarking might allow better allocation of funds among contractors for the purpose of environment, safety, and health protection.

PROPERTY MANAGEMENT COSTS

In Fiscal Year 1992, personal property owned by the Department of Energy had a book value of approximately $13 billion. The Department generated $345 million in excess personal property and disposed of $355 million in surplus personal property through donations, sales, transfers, and other methods.[39] Additionally, DOE owns approximately 10,000 buildings and 15,000 miscellaneous structures at 52 major sites in 120 locations across 45 states. In 1992, DOE allocated approximately $1.5 billion for preventive and corrective maintenance on its buildings, equipment, roads and grounds, and other property.

Contractors do not always properly manage, control, or account for DOE-owned property. Moreover, DOE lacks a consistent, thoroughly defined oversight program, and uses few, if any, established property management performance measures in its contracts.

Further, the Department does not have a system for tracking, monitoring, and reporting facilities management activities and accumulating costs associated with the maintenance of facilities. Since there is no standardized program for management contractors to report their maintenance costs, DOE cannot benchmark its performance against real property managers in other government agencies and the private sector. Without this kind of benchmarking, it has been difficult to establish contractual performance requirements essential to identifying, verifying, and controlling costs of maintenance activities.

These deficiencies may result in government-owned personal property being lost, misplaced, or stolen.[40]

Action: ***Establish effective contract performance measures for real and personal property management and accountability.***

Effective contract performance measures for property management and accountability serve to decrease costs and increase inventory accuracy. DOE's *Personal Property Management Systems Appraisal Guide* (January 1992) identifies measurable criteria for all property management functions.[41] The Department should adjust these criteria and establish quantitative goals by benchmarking property management functions of the Department and its contractors against property managers within the private sector as well as other government agencies.[42] The criteria need to be reviewed and periodically updated. When established, these additional measures will enhance the Department's ability to monitor contractor performance and to identify areas where improvements are needed.

Action: ***Manage contractors' maintenance costs more effectively.***

DOE will establish a system for tracking, monitoring, and reporting the accumulation of costs associated with real property and facilities maintenance. This system will improve contractor accountability and the

Department's ability to develop maintenance budgets. As part of performance-based contracting, all management contractors should accurately accumulate, track, and monitor facility maintenance costs in a fashion that can be used to compare property management costs per square foot for various contractors throughout the Department. These reports should allow costs per square foot to be compared for facilities of comparable vintage and function. DOE should use information obtained through Department and contractor data systems to develop performance measures for maintenance costs.

CONTRACTOR PENSION AND INSURANCE COSTS

DOE's management of contractor human resource programs includes responsibility for oversight of reimbursable management contractor actions relating to 80 defined benefit and defined contribution plans covering approximately 140,000 contractor personnel nationwide. Pension fund actions are highly complex and involve funding, plan amendments, segment restructuring, contract amendments, spinoffs and mergers, pension plan and contract terminations, and temporary investments. Pension plan assets dedicated to contractor employees currently amount to approximately $13 billion. The lack of qualified personnel has hampered DOE's ability to manage contractor pension costs.

Action: ***Develop a Department-wide policy on pension fund management and oversight.***

The Department should have an explicit policy on its management of pension fund obligations. It should include guidance on funding, benefit levels, employee transfers, and treatment of incumbent employees when a change in contractor occurs. Additionally, DOE should assess the need for additional resources for pension fund oversight. The Department should assess the proper mix of new or retrained federal employees and outside experts needed to do the most cost-effective pension oversight.

The Department already has begun taking certain actions to reform its administration of contractor pension funds. It is analyzing its options to try to obtain the financial advantages of excess funding of pension assets paid for by government funds. It has also instituted a policy that will be effective in Fiscal Year 1995, if not before, for recognizing the present value of enhancement in pension fund benefits made as part of its workforce restructuring.

Action: ***Develop Departmental policy on claims adjustment and evaluation of contractor risk management.***

Critical components of a Department-wide program for insurance management should include the award of a Department-wide claims servicing contract, the development of a risk management information system, and appropriate revisions to DOE Order 3890.1, "Contractor Insurance and Other Health Benefits Programs." Such a program should also improve DOE's risk management process. Areas of risk management needing improvement include a lack of comprehensive risk management policy, poorly understood coverages under comprehensive general liability policies, unrecognized and unfunded liabilities, and a lack of relevant risk management experience in Operations Offices.

This program would improve: (1) DOE's safety and health activities, (2) communication and information exchange between and among DOE and contractor personnel responsible for the program, (3) operational efficiency through uniformity and consistency, and (4) the performance of DOE personnel in risk management through better training and timely information.

OVERTIME COSTS

The Department of Energy does not adequately supervise contractor overtime costs. Often overtime can save money, compared to not doing the job at all or hiring new permanent workers. However, overtime can also be abused. For example, in Fiscal Year 1992, 9 percent of the contractor workforce earned greater than 40 percent of its earnings from overtime compensation. In Fiscal Year 1993, that percentage dropped to 7 percent. Further reductions should be obtained through improved work definition and better management of personnel.

Action: ***Implement improved overtime policy.***

Existing controls will be expanded to ensure the most appropriate and judicious use of contractor overtime. Among the types of controls that will be considered are:

- Establishing a percentage threshold by site, by labor category, and by individual, where appropriate, for acceptable overtime usage.
- Creating a process by which contractor overtime usage above the guidelines will be specifically approved by the Field Operations Office Manager.
- Assigning to each site an appropriate target for reducing contractor use of overtime. By March 1, 1994, the Associate Deputy Secretary for Field Management will report to the Deputy Secretary concerning the development of policy to control over-time, and the procedures that have been implemented to enforce the policy.

UNCOSTED BALANCES

The Department had uncosted balances of over $10.4 billion at the end of Fiscal Year 1993. "Uncosted balances" are funds that the Department obligates to a management contractor for which the contractor has not yet incurred actual costs. The Department obligates funds to its contract work based on an annual program plan. However, the Department's planning and budgeting process has outpaced the contractors' abilities to accomplish the work.

DOE should review uncosted balances twice each year to allow senior management of the Department to determine the reasons for the delay in project funding. Moreover, to the extent that cost savings may be realized by improved program management, those amounts should not simply be lost under the heading of "uncosted balances."

Action: ***Conduct two reviews of uncosted balances each year.***

It would not be true reform simply to eliminate DOE's practice of maintaining uncosted balances, creating incentives for contractors to spend the funds more rapidly than necessary simply to retain funding for capital projects. Automatic reprogramming of uncosted balances could be counterproductive.

Accordingly, beginning in Fiscal Year 1994, the Chief Financial Officer should prepare a report by July 1 and November 1 each year concerning uncosted balances, and DOE's Deputy Secretary or Under Secretary should meet with the relevant Assistant Secretaries of each major program with significant uncosted balances to determine whether and to what extent any uncosted balances should be reprogrammed or identified for use in offsetting future budget requirements. The Chief Financial Officer will continue to prepare the annual report to Congress on uncosted balances mandated by the Energy Policy Act of 1992.

THE ADVANCE-FUNDING MECHANISM

Under the special bank account system, DOE provides advance payment under a letter-of-credit arrangement and special bank account. Through this advance payment mechanism, contractors do not have to finance the costs of operations. As a result, DOE avoids having to compensate contractors for such costs through higher fees. In addition, both DOE and the contractor are freed from the administrative burden of monthly payment processing.

A significant disadvantage of this advance-funding mechanism, however, is that DOE depends on the contractor to identify and remove unallowable costs from its accounts. Additionally, to the extent that costs are disputed, DOE's ability to withhold funds is limited. Thus, DOE has experienced difficulty in recouping questioned costs when the contractor refuses to reimburse DOE.

Action: ***Re-examine the need for advanced funding through special bank accounts.***

The Department must review its practice of funding its M&O contracts in advance through the use of special bank accounts and letters of credit. DOE's Chief Financial Officer and Assistant Secretary for Human Resources and Administration should undertake a cost-benefit analysis of the use of the special bank accounts and the feasibility of eliminating this practice. To the extent that elimination of the practice is uneconomic or infeasible, DOE should revise its cost-reimbursement contracts to provide an effective mechanism to require contractors to reimburse DOE for any disputed cost item.

Modifying and Improving Cost-Reimbursement Policies

DOE's contracting policy must focus on payment for results and not simply payment for incurred costs. This discussion provides an overview of DOE's traditional rules and policies for reimbursing costs under cost-reimbursement contracts, and describes the need to reform those policies.

> DOE's contracting policy must focus on payment for results and not simply payment for incurred costs.

Historically, the Department's policy has been to reimburse its management contractors for virtually all costs incurred in the performance of their contracts, including fines and penalties, third-party liability claims, and damage to government property. The only costs not paid by the Department were those resulting from willful misconduct or lack of good faith by the contractor's top-level management personnel; costs found not to be reasonable, based on, among other factors, the exercise of prudent business judgment; and costs specified in the contract as unallowable. Rarely have costs been disallowed.[43]

APPLYING THE ACCOUNTABILITY RULE

Beginning in the 1980s, the Department came under increasing criticism for the management of its weapons production and research facilities. The Department's policy of reimbursing almost all of its contractors' costs (which insulated contractors from the economic consequences of their actions) and its inadequate oversight of contractor performance have been viewed as major contributors to the serious environmental, safety, and health problems facing these facilities.

Early in 1991, partly in response to criticism of its contracting policies, the Department modified its cost-reimbursement policies by requiring that the profit-making contractors assume certain risks of contract performance. This new requirement, called the "Accountability Rule," makes the contractor liable for certain costs, known as "avoidable costs," which result from the negligence of the contractor's or subcontractor's employees. However, it contains a number of qualifications that undercut its effectiveness:

- If DOE is responsible in any way for the incident that resulted in the additional cost, then no avoidable cost results and the cost is reimbursable.
- In making an avoidable-cost determination, DOE must consider a number of different—and, in some cases, inconsistent—guidelines that are overly complicated and impractical and burdensome to administer.
- The rule imposes a ceiling on the liability of a contractor for avoidable costs.

- The rule does not apply to nonprofit contractors.

In application, the Accountability Rule appears to have had little measurable impact on contractor accountability or performance. At the same time, it has resulted in a significant cost increase to the Department. A review of one year of contract performance under the Accountability Rule disclosed that administrative costs of implementing the rule were estimated to be $2.5 million for both DOE and the five contractors reviewed.[44] In addition, the contractors earned an additional $22.8 million in fees as compensation for the increased risk they presumably assumed under the new provisions.[45] During the same year, costs determined to be "avoidable" totalled just under $1 million, and the contractors' performance ratings evidenced no appreciable improvement. It is possible that the deterrent effect of the Accountability Rule discouraged contractors from incurring avoidable costs, but there is little evidence to support a conclusion that the rule has been worth its administrative cost.

In order to increase contractor accountability and create a more equitable and rational allocation of the costs and risks of contract performance between the Department and contractors under the new performance-based management approach, a number of changes need to be made to DOE contracting policies concerning reimbursement of fines and penalties, third-party liabilities and costs resulting from damage or loss to government property. Because many of the actions will apply to nonprofit contractors as well as profit-making firms, thereby imposing greater risks on nonprofit contractors than they incur under current DOE policy, the Department will reconsider its policy against paying management or award fees to educational institutions.[46]

COMPARING ACQUISITION POLICIES

The Department has a complete set of cost provisions for M&O contracts that are incorporated in the Department of Energy Acquisition Regulation (DEAR).[47] A detailed comparison of the DEAR to the Federal Acquisition Regulation indicates that, while they appear to differ extensively, the differences, in most cases, are not substantive. Other than certain discrete cost items, such as fines and penalties, there are few, if any, specific costs that are allowable under the Department's regulations but unallowable under the Federal Acquisition Regulation.

In the case of costs such as fines and penalties, the arguments advanced for less stringent treatment of DOE's management contractors (for example, DOE ownership and control of the site) are outweighed by the strong public interest in and concern for compliance with environmental laws and regulations. With respect to other cost principles, the Federal Acquisition Regulation usually provides considerably more detailed and specific guidance for allowability/unallowability determinations than the Department's regulations.

For example, the Federal Acquisition Regulation provides extensive direction on contractor accountability and responsibility for government property, while the Department's direction on M&O contracts in this area is brief and general. When a contracting officer questions a particular contractor activity or incurred cost, the generality of the DEAR has provided DOE management contractors a basis for arguing that the cost is allowable.

The first step in dealing with these problems will be to overhaul the current reimbursement rules in the DEAR regarding avoidable costs. In the longer term, the Department should consider revising its procurement regulations to apply to performance-based management contractors the same cost principles and provisions that apply to other government contractors. Eventual adoption of the cost principles contained in the Federal Acquisition Regulation will send a signal to DOE contractors that the Department intends a businesslike contractual relationship based on clearly articulated standards and criteria for the reimbursement of costs. Because these principles are used throughout the government, their adoption will add a significant measure of uniformity and consistency to the Department's contracting for the management and operation of its facilities and sites. DOE's contractors, in effect, will be subject to the same rules as other government contractors.

Action: *Revise the Department of Energy Acquisition Regulation provisions on fines and penalties, third-party liabilities, and related matters.*

Because of its traditional practice of reimbursing virtually all costs incurred by M&O contractors, the Department has, in effect, assumed most risks of contract performance. For example, because the Department ordinarily reimburses the contractor for civil fines and penalties incurred in contract performance, contractors have less incentive to comply with applicable laws and regulations than they would if such fines and penalties were disallowed. Similarly, the government's assumption of the economic costs of third-party liabilities probably reduced contractor incentives to minimize these liabilities. The Accountability Rule attempted to address this problem by shifting certain risks of performance (i.e., for avoidable costs) to the contractor.

Instead of using the Accountability Rule, the Department should amend the DEAR to eliminate its avoidable-cost provisions, to develop substantive standards similar to those in the Federal Acquisition Regulation, and to establish a rebuttable presumption of unallowability for fines and penalties, third-party liability, and damage to or loss of government property. The amendment to the DEAR would make these costs unallowable unless the contractor is able to make certain affirmative showings:

- **Fines and Penalties.**[48] Fines and penalties would be unallowable unless the contractor shows to the satisfaction of the contracting officer that: (1) they were incurred as a result of compliance with specific terms and conditions of the contract or written instructions from the contracting officer; (2) they were incurred by reason of conditions of the site that were in existence prior to the contractor's first contract at the site after 1993, and that the contractor had no opportunity to remedy; or (3) they were imposed without regard to whether the contractor was at fault or exercised due care, and could not have been avoided by the exercise of due care by the contractor or its employees.

- **Third-Party Liabilities.** Third-party liabilities would not be allowable unless the contractor shows to the satisfaction of the contracting officer that they did not result from: (1) willful misconduct or lack of good faith by the contractor's managerial personnel; or (2) failure to exercise prudent business judgment. Punitive damages would not ordinarily be allowable under this standard.

- **Loss of or Damage to Government Property**. Same standard as for third-party liabilities.

The current Accountability Rule cap should be removed. Indemnification for damage resulting from nuclear activities carried out by DOE contractors would continue to be provided, as required by the Price-Anderson Amendments Act of 1988, 42 U.S.C. 2210(d). Furthermore, the Department would not reimburse any portion of insurance premiums to cover such unallowable costs. The above rules would apply to nonprofit contractors, unless criteria articulated in accordance with the next action in this report indicate that separate treatment is required.

These changes are intended to simplify contract administration and enhance contractor accountability. As in the Federal Acquisition Regulation, fines and penalties are allowable if incurred because of specific contract terms or instructions of the contracting officer. However, in recognition of the environmental conditions that a DOE contractor is likely to inherit when taking over a facility, an exclusion is also provided for certain pre-existing conditions. In addition, in some cases, fines and penalties assessed under strict liability statutes would continue to be allowable.

With respect to third-party liabilities and damage to government property, the disallowance rules reflect generally applicable Federal Acquisition Regulation standards relating to willful misconduct, lack of good faith, and reasonableness of costs (i.e., failure to exercise prudent business judgment).

Action: ***Apply comparable reimbursement rules to nonprofit contractors***.

The above changes in the Department's cost-reimbursement policies would apply to nonprofit contractors, unless a specific determination were made at the time the contract is negotiated that (1) there is a programmatic need for nonprofit contractors to compete for the contract and (2) a particular reimbursement rule would make it unlikely that such nonprofit contractors would compete.

With respect to third-party liabilities and damage to government property, the proposal to subject nonprofit contractors to the new rules applicable to for-profit contractors would not substantially change the standard of unallowability currently applicable to nonprofit contractors (i.e., willful misconduct, lack of good faith, or reasonableness). However, it would revise the process for making allowability determinations by establishing a rebuttable presumption of unallowability.

With respect to fines and penalties, the proposed change differs significantly from the current DEAR by holding nonprofit contractors responsible for fines and penalties unless one of the exclusions applies. However, the proposed change is less restrictive than the current Office of Management and Budget Circular governing nonprofit educational institutions (OMB Circular A-21), because it does not disallow fines and penalties resulting from pre-existing conditions or from the imposition of strict liability.

Action: ***Develop guidance on determining the "reasonableness" of contractor costs.***

Even though a particular cost may be identified as allowable under the cost principles, it still must be "reasonable" to be reimbursed.

"Reasonableness" deals with the standard of care the contractor must observe in incurring reimbursable costs. Generally, a cost is reasonable if it would be incurred by a prudent person in conducting a competitive business.

The traditional M&O contracts generally include a provision requiring that costs must be reasonable. However, as a practical matter, costs incurred by DOE's management contractors have rarely, if ever, been disallowed because they were found to be unreasonable.

The key to effective use of the reasonableness standard in assessing the allowability of contractor costs is timely review by knowledgeable and experienced agency staff, taking into account sound business practices and specific programmatic requirements. Guidelines should be developed to aid Department staff in determining the reasonableness of contractor costs.

Management contractor costs should not be presumed to be reasonable merely because they are not specifically unallowable.

Action: ***Develop and implement a contractor indemnification scheme for response action contractors, consistent with the principles of section 119 of CERCLA.***

Section 119 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601, authorizes the President to provide limited indemnification to "response action contractors" against any liability resulting from the contractor's negligence during the investigation and cleanup of a facility or site on the National Priorities List.

Section 119 of CERCLA protects response action contractors from liability under any federal law for injury or damage resulting from a release or threatened release of a hazardous substance, as long as the contractor is not guilty of negligence or intentional misconduct (i.e., protection against "strict liability" under federal law). Section 119 also authorizes the President to indemnify such contractors against any third-party liability resulting from their negligence. The indemnification specifically excludes liability resulting from gross negligence or intentional misconduct by the contractor. It also does not extend to liability under state law other than liability for negligence (for example, "strict liability" for "abnormally dangerous activities").

While some of the specific requirements and limitations of CERCLA section 119 and the guidelines may not be appropriate for the scope and extent of cleanup work at DOE sites and facilities, section 119 does offer a guide to the Department in fashioning the limits of its exposure to cleanup liabilities and to increase contractor accountability. The Department, therefore, should develop contract provisions and clauses to limit reimbursement of contractor-incurred, third-party liabilities resulting from environmentally related injury or damage. These provisions would be used in contracts for environmental cleanup work as appropriate.

Reducing Costs of Contractor Litigation

DOE spends over $30 million annually to pay the fees of outside counsel retained by its contractors. These fees are incurred largely in defense of actions brought by third parties.[49]

There is no written DOE guidance on the practices and procedures to be used by the Department's Operations Office Counsel to monitor ongoing litigation. As a result, the Chief Counsel in DOE's Field Offices have developed their own operating practices, which differ somewhat from office to office.

Over the last 10 years, the Department occasionally assumed direct responsibility for the defense of significant litigation filed against its management contractors. In recent years, contractors have managed most litigation with minimal involvement by the Department. Pursuant to the litigation and claims clause and the allowable-cost provisions contained in most M&O contracts, DOE Chief Counsel Offices have established various formal or informal methods for consultation with management contractors and approval regarding the conduct of litigation. On significant policy questions, Chief Counsel Offices coordinate with Headquarters litigation counsel.

These methods are not sufficient to control litigation expenses. The Department has examined the nature and scope of outside counsel expenditures and concluded that improvements are required in: (1) the compensation arrangement employed by DOE contractors when retaining outside counsel; (2) cost-control mechanisms as litigation proceeds; and (3) litigation management strategies.

Action: ***Issue uniform guidance on the review and oversight of contractor litigation.***

The issuance of written guidelines and procedures for Operations Office Chief Counsel review and oversight of contractor litigation will institutionalize cost-reduction and litigation management techniques. The written guidance will require that cost-reduction techniques be evaluated at the outset of the retention arrangement and, in turn, implemented by the contractor counsel. For example, careful review of retainer agreements will avoid overstaffing, layering of partners and associates, and unreasonable hourly rates and litigation support fees. Significantly, the guidance will encourage designation of lead counsel for each class action, to avoid duplication of effort when several law firms are hired by contractor counsel in multiple defendant cases. Specific advance approval by DOE will be required for the use of more than one law firm to perform any particular task in any given class action.

The guidance also will require that the Chief Counsel consider, in appropriate cases, the use of innovative compensation arrangements, such as alternative fee arrangements,[50] shared staffing, and teaming arrangements. Finally, contractors should be required to develop litigation management procedures that are consistent with the guidance issued by DOE.

Action: ***Institute training in litigation on management techniques.***

Spiraling litigation costs have caused corporations across the country to scrutinize the litigation management practices of their legal departments and to develop novel cost-saving approaches. The cost-reduction techniques mentioned in this report, as well as other more traditional approaches (for example, litigation profiles, discounting, and auditing), are the subject of commercial training courses and are discussed regularly by associations comprised of corporate counsel. DOE counsel could benefit greatly from such training.[51]

Action: ***Select one or two large pilot cases for immediate implementation of litigation cost-reduction techniques.***

The General Counsel reviewed pending class action cases and identified one to serve as a pilot case for immediate implementation of appropriate cost-reduction techniques and for development of practical applications of these techniques. DOE counsel (Operations Office Chief Counsel and Headquarters counsel), in coordination with contractor in-house and retained counsel, are in the process of conducting an analysis of the pilot case, including its costs, associated litigation strategy, and prospects for settlement/trial, and are developing a strategy to minimize costs.

While work on the initial pilot case is underway, the Department is reviewing other pending class action cases to develop and implement a strategy for cost minimization.

Litigation management plans should address such issues as limiting the number and duration of depositions conducted by each side; limiting the number of lawyers who can attend the deposition; mock trials of cases to determine the likelihood of success on the merits and the adequacy of preparation by counsel; restrictions on the number of lawyers within a firm who can work on particular matters, to prevent cases from being used as training exercises for junior associates; the use of specialized contractors to serve as document reviewers and paralegals instead of the use of personnel at various law firms; and limitation on the number of drafts and the number of pages in briefs.

Action: ***Develop an explicit policy concerning the allowability of defense costs in "whistleblower" cases.***

A Departmental initiative being undertaken in parallel with the Contract Reform Team's work is a Steering Committee established by the Secretary in November 1993 to consider issues associated with the Secretary's commitment to "zero tolerance" for reprisals against whistleblowers, and to review prior whistleblower complaints of employees who did not have available to them the protections afforded under the Department's Contractor Employee Protection Program[52] or Department of Labor programs.

One of the issues being considered is the extent of reimbursement of contractor costs of defending whistleblower actions. Such litigation costs and judgments would fall within the general cost principles currently applicable to M&O contracts, which generally permit the reimbursement of such costs, unless they are unreasonable, result from willful misconduct or lack of good faith on the part of the contractor's senior management, or otherwise are proscribed by law (for example, the Major Fraud Act of 1988).

The Whistleblower Steering Committee is concluding its consideration of the issues relating to the Secretary's commitment, and is examining the allowability of whistleblower defense costs to ensure that it is consistent with the Department's policy of "zero tolerance" for reprisal against whistleblowers. The Steering Committee expects to present recommendations to the Secretary in February 1994.

IV.

Specific Initiatives in Progress

The Department initiated efforts to change and improve its contracting practices before the Contract Reform Team began its work. The following programs and activities provide examples of these efforts. They reflect the Department's use of a variety of approaches to cooperate with the private sector in managing the Department's facilities more cost-effectively by improving the contracting process.

Freezing Salaries of M&O Contractors

On May 21, 1993, the Secretary of Energy announced that the Department had frozen the salaries of the employees of its management contractors for a period of one year. This initiative will save the government $1.55 billion over a five-year period, including a savings of approximately $220 million the first year. The savings in subsequent years result from the accumulated savings from not increasing salaries in Fiscal Year 1994. The freeze does not apply to promotion increases, and exceptions may be made for special circumstances.

Using Performance-Based Management Contracts at Rocky Flats

With the cessation of nuclear weapons production at Rocky Flats in January 1992, the Rocky Flats Plant began the transition from a production site to a site dominated by environmental restoration, cleanup, and waste management activities. In anticipation of the expiration of the current management contract at Rocky Flats on December 31, 1995, the Rocky Flats Operations Office has developed a new contracting strategy to reflect its new mission.

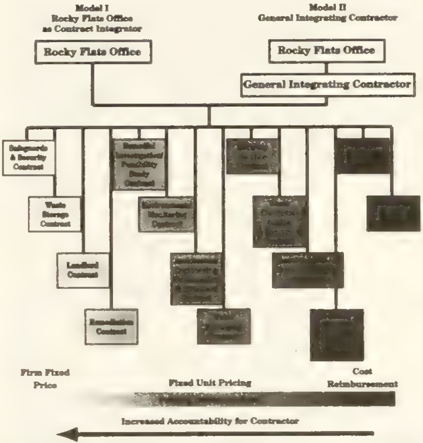
The objective of this strategy is to identify and develop contracting methods and practices that integrate industry and marketplace ingenuity into government procurement and operating practices at Rocky Flats. The approach will allow prospective contractors to define the work scope, operating parameters, incentives, and disincentives to accomplish the overall program goals. Key elements of the strategy include:

- Use of an appropriate mix of contractors and contract types, including fixed-price contracts.
- Identification of performance goals that focus on results.
- Use of performance-based criteria and measures.
- Use of contractor incentives.
- Increased competition among contractors for the variety of tasks at the site.
- Appropriate use of small and disadvantaged businesses.
- Increased contractor accountability.
- Proposed use of government/private-sector partnership arrangements.

DOE is considering two model strategies for managing the contracts at Rocky Flats (Figure 8):

- **Model I.** The Rocky Flats federal staff will integrate all site contract actions. These contracts, as awarded by the Department, will range from administrative and landlord service functions, to the various cleanup work activities and technology development for the site.
- **Model II.** A general integrating contractor will support the Rocky Flats federal staff in their contract management activities by overseeing the same range of contracts covered in Model I. Just as in the first model strategy, this second strategy will require contracts to be awarded by the Department's staff. This second strategy would be necessary in instances where the

Figure 8
Rocky Flats Contracting Models


Model I
Rocky Flats Office
as Contract Integrator
Model II
General Integrating Contractor
Rocky Flats Office
Rocky Flats Office
General Integrating Contractor
Safeguards & Security Contract
Remedial Investigation/ Feasibility Study Contract
Waste Storage Contract
Environmental Monitoring Contract
Landfill Contract
Remediation Contract
Firm Fixed Price
Fixed Unit Pricing
Cost Reimbursement
Increased Accountability for Contractor

Department determines that specialized project integration skills are available only from contractor sources. The ultimate objective would be to eventually have federal staff who are trained and experienced to assume these responsibilities.

The Department is soliciting suggestions from its stakeholders at Rocky Flats to develop site-specific strategic objectives and to break down the scope of work at the site to determine the appropriate mix of contractors, contract types, and contract provisions. In other words, the new Rocky Flats contract strategy will be to choose from the wide variety of innovative, performance-based contracting tools described in this report to achieve the best contract results at the lowest cost to the government.

Reforming Competition at the Idaho National Engineering Laboratory

The activities of the Idaho National Engineering Laboratory (INEL) include waste management, environmental remediation, reactor technology, spent fuel management and research, and advanced engineering in a broad array of technologies. In April 1993, the Department's Idaho Operations Office issued a Request for Proposals from industry, academia, joint ventures, and other team arrangements capable of innovative, entrepreneurial leadership. This Request for Proposals used a new approach in consolidating five incumbent M&O contracts into a single contract. Tailored to the specific programmatic purposes of the INEL, this solicitation was designed to result in a strong performance-based contract that is output- (product-) oriented, in contrast with the past input (budget) orientation.

In the Request for Proposals, DOE provided a detailed outline of the work to be done, a profile of current operations, and a list of the desired performance attributes in the management of the INEL. A central theme of the Request for Proposals was that, rather than being prescriptive in telling the offeror how to accomplish the work of INEL, the Department invited the offeror to be innovative and visionary in proposing approaches to accomplishing the work. DOE asked companies to address such matters as:

- The contractors' vision of what the INEL should be in 10 years.
- How they would manage costs, staffing, and organization.
- What their approach to enhancement of industrial competitiveness would be.
- How their efforts would enhance regional economic diversification.
- How they would build employee loyalty.
- How innovation and creativity would be instilled in employees.
- What their approach would be for compensation and innovative fee arrangements.

Consistent with the Department's contract reform efforts, the request also invited proposals on nontraditional contractor incentive arrangements that would result in cost savings in contract performance that would benefit both the Department and the contractor. In short, the new approach developed for the INEL requested contractors' input as to how DOE contractors are tasked, evaluated, and rewarded for their performance. The Department is in the process of evaluating the responses to the INEL Request for Proposals.

Financial Management Initiatives

The Department has undertaken a number of financial management initiatives aimed at improving contractor operations and contracting practices.

Improving Contractor Financial Management Systems

The Department's management contractors each operates separate and unique financial management systems. There is little commonality among contractors' systems, except for the ability to submit information within the parameters of the Department's reporting requirements. This results in data that may not be comparable between contractors.

Last year the Department chartered a Financial Management Systems Improvement Council. Membership on the council includes representatives from 10 contractors and 2 field sites, and 4 representatives from DOE's Office of Chief Financial Officer, including the Deputy Controller. The goals of the council are to improve contractor financial management system processes by (1) sharing successful approaches (best business practices) and benchmarking among contractors; (2) developing business requirements and common terminology for financial management systems; and (3) identifying systems that lend themselves to common processes and the pursuit of standardization where appropriate. Although these efforts are for the most part long term, initial results from benchmarking and the potential for system sharing show numerous opportunities for improving operational efficiency and future cost avoidance.

Including Financial Management Systems in the Five-Year Planning Process

For many years, federal agencies have been required to prepare and submit to the Office of Management and Budget five-year financial system plans. This requirement has been incorporated into the annual Information Resources Management Call for systems planning information.[53] Since the Department's management contractors spend large amounts of money on developing and enhancing financial management systems, the Department recently expanded the requirement to include them in the five-year planning process. Information collected through this mechanism will also be used by the Financial Management Systems Improvement Council to establish a baseline and to track contractor financial management system efforts over the next several years.

Standardizing and Strengthening Financial Management Contract Clauses

The Department has taken steps to strengthen and standardize financial management clauses contained in its M&O contracts. Many of the M&O contracts did not contain contract clauses that other federal agencies commonly use to protect the government's interests (for example, cost accounting standards). To exacerbate this situation, significant deviations from DOE standard contract clauses existed within individual contracts.

The use of the standardized and strengthened contract clauses is a significant step toward improving the Department's financial management of its contractors. In 1994, the Department will be issuing these revised clauses through the *Federal Register* rulemaking process and will apply them to the new Performance-Based Management Contracts.

Requesting Audited Financial Statements of All Contractors

The Chief Financial Officers Act of 1990[54] requires federal agencies to prepare audited financial statements for commercial functions, including revolving and trust funds. While the Department has been in full compliance with the requirements of the Act, only a portion of DOE's management contractors have been covered by these audits.

Because a significant amount of the Department's funding flows through contractors, the Department is considering the costs of, and benefits to be derived from, extending the audited financial statement requirements to all contractors. A fully certified statement may entail additional costs that may exceed $10 million. The Chief Financial Officer will provide a recommendation in April 1994.

Reviewing Unfunded Liabilities

The Department recently completed a review to determine whether liabilities, including contingent liabilities, of the Department and its management contractors were appropriately funded and recognized to prevent increasing fixed claims on revenues in future years. The review focused primarily on the following types of liabilities:

- Lease purchases and capital leases.
- Pensions.
- Post-retirement benefits other than pensions.
- Post-employment/termination benefits, such as severance and health insurance.
- Claims and judgments against management contractors.
- Workers' compensation under contractor-managed programs.
- Contract termination costs.

With the exception of the "post-retirement benefits other than pensions" category, the review indicated that the Department was properly using current budget authority to cover each of these management contractor liabilities.

The review also concluded that DOE faces a multibillion-dollar liability for post-retirement benefits other than pensions. The Department has determined that it is not feasible to obtain the necessary budget authority to fully fund this liability. Therefore, it plans to continue to include, in annual budget requests, funds to cover that portion of the liability requiring payment during a particular fiscal year. The Office of Management and Budget has informally agreed with this approach. The Department is in the process of obtaining more accurate estimates that will provide the basis for recognizing the total post-retirement benefits other than pension liability in its financial statements.

Converting a Cost-Reimbursement Contract to a Fixed-Price Contract — Hanford Site

Providing a contract for the purchase of goods or services, while letting private firms undertake the capital cost, can insulate the government from cost overruns and the cost of future infrastructure improvements. The Hanford site[55] provides two examples of how this might be done. An analysis done by federal managers at Hanford showed that a private firm could construct and maintain the laundry facilities required at the site at a fraction of the price that the government could, principally through avoidance of DOE and contractor project management requirements. Under this new approach, the federal government pays for the outputs of the laundry—the laundry services themselves—rather than paying for the capital costs and costs of operating the laundry directly. Precious capital funds could be reserved for priority environmental cleanup projects, rather than for this form of an indirect-cost project.

Another significant project at the Hanford site, if undertaken, also might illustrate how even larger savings could be obtained through the use of contracts in which the federal government pays for outputs, and private firms bear the risk of any cost overrun. Vitrification of the Hanford tank waste will require a large-capacity, commercial-scale facility to receive highly radioactive liquid waste, convert the liquid waste into solid glass, and provide interim storage of the glass waste before the shipment to a geological repository. A consortium of companies has presented a concept to design, construct, and operate a privately owned plant of sufficient capacity to process Hanford's liquid waste.

Under this concept, DOE would make no payments to the contractor until the vitrification capacity is actually available to the Department. Payments over the life of the contract would be based upon the plant capacity and output. The private owners of the facility would obtain their own financing.

The Department will be very receptive to the economic format of this type of proposal. However, for output contracts to work, the scoring rules applied by the Office of Management and Budget in the federal budget process require modification. Current scoring rules require realization of the entire contingent liability on a contract at the time of award. These rules encourage cost-reimbursement contracts that push the risk of cost overruns on the government. That type of incentive should be eliminated, and the Office of Management and Budget has indicated its willingness to consider the application of reasonable scoring rules so as not to discourage the signing of output-oriented contracts.

Reforming the Naval Petroleum and Oil Shale Reserves Program

The Naval Petroleum and Oil Shale Reserves program grew out of fears arising before and during World War I that the United States would run out of petroleum products to fuel the U.S. Navy fleet. Those fears have passed. After the Arab Oil Embargo, the United States began actively drilling on the Reserves and selling oil and gas commercially. The value of the Elk Hills field in California is demonstrated by the fact that it is the seventh largest producing field in the lower 48 states and produces more natural gas than any other field in California.

At Naval Petroleum Reserve No. 1 Elk Hills, which is located outside of Bakersfield, California, DOE is the operator. DOE operates Elk Hills under a traditional M&O contract, rather than an operating agreement, as is customary in the oil and gas industry. This arrangement has resulted in several inefficiencies.

For example, both the Department's program office and a panel of industry experts agree that the operation of the Elk Hills field with a traditional M&O contract, subject to the same rules and regulations that govern nuclear facilities, has resulted in substantially greater costs to the taxpayer than would be generated by a comparable site under private management. This report concludes that the M&O contractor's goal is to maximize the award fee, which is not necessarily consistent with maximizing the value of Elk Hills to the owners. For example, total (M&O contractor) costs increased 35 percent between 1986 and 1991, from $125 to $169 million per year. The contractor's annual profits (award fee) between this same period increased 44 percent, from $3.1 to $4.5 million. However, the total revenue at Elk Hills decreased 15 percent over this same period.[56]

In addition, the lack of a federal capital budget discourages investment planning at Elk Hills. The two-year lag time between budget planning and funding creates further inefficiencies that would not be experienced by a private oil company.

Finally, the oil and gas from the Naval Petroleum and Oil Shale Reserves program are sold through a cumbersome federal process that conforms with restrictive statutory requirements to sell the petroleum competitively to the highest bidder. This practice imposes a significant cost on bidders and lowers the price the government would receive compared to prices that would be received from private sellers. A potential purchaser receives sales forms at least half an inch thick, rather than the few pages that would be used by a private seller in its contract to sell oil.

To reform the Naval Petroleum and Oil Shale Reserves program at Elk Hills, consistent with the thrust of this report and the National Performance Review, the Department will:

- Consider using an operating contract modeled after traditional commercial standards. A commercial operating agreement typically designates a substantial equity owner in the oil and gas field to manage and operate a field. This approach serves to reduce the costs of operations and maximize the incentives for increasing net revenues.

- Convene a meeting of various Departmental elements in February 1994 to discuss on an order-by-order basis all Headquarters orders, rules, directives, and regulations that have been specifically identified by the program as adding to costs without significantly adding value. In each case, the management group will consider least-costly means to accomplish the same objectives.

The purpose of all these reforms would be to replace an M&O contract with a performance-based contract, focusing on performance criteria similar to those used by a board of directors of a sophisticated private oil company.[57] The Department expects this action to increase revenues and cut program costs by 1995.

Making the Environmental Management Program a Pilot Program

Some of the challenges being addressed by DOE's Environmental Restoration and Waste Management program are:

- Management and cleanup of waste created as a result of research, development, and production of nuclear weapons and nuclear energy at 110 DOE sites across 32 states.

- Continued growth of work scope as the program undertakes the decontamination and dismantlement of additional surplus defense-related facilities.

- Management of the remediation of 400 buildings in the nuclear weapons complex, with another 1,150 buildings to be transferred into Environmental Management from other DOE programs. Another 1,450 potentially contaminated buildings exist in the complex.

DOE recently proposed using the Environmental Management program as a pilot under the Government Performance and Results Act, which requires strategic planning based on measurable performance indicators. DOE requested that the Office of Management and Budget allow the Environmental Restoration and Waste Management program to increase its staff by 1,600 positions (400 in Fiscal Year 1994, 800 in Fiscal Year 1995, and 400 in Fiscal Year 1996). The savings are estimated to exceed $500 million over three years as a result of substantially increased federal management of DOE contractors. These new positions will significantly increase the efficiency and effectiveness of its cleanup program, enable DOE to significantly reduce the most serious public health risks, and accelerate commercialization of promising environmental cleanup technologies. The program also includes specific performance measures, which will better enable the program managers to improve the efficiency of the program and permit external reviewers to track the program's success.

The Office of Management and Budget has approved 400 additional full-time positions in Fiscal Year 1994 and 800 additional positions in Fiscal Year 1995.

Reducing and Streamlining Internal Regulations and Directives

The Department has initiated a new management system to improve the processes for developing, coordinating, and implementing DOE internal regulations and directives. The system will result in streamlined and value-added internal regulations, including local requirements issued by DOE Headquarters and Field Offices.[58]

The Department has developed a two-step strategy to implement the new system:

- A Department-wide steering group has responsibility for coordinating the task and providing consistency in approach. The focus will be on identifying and eliminating nonessential requirements, clearly separating requirements from guidance, and consolidating requirements.
- Departmental elements that issue internal regulations will be responsible for documenting internal approaches, identifying near- and mid-term targets for eliminating, streamlining, consolidating, and conducting a detailed review of their internal regulations by July 1, 1994. Consolidations and revisions are to be completed by September 1996.

Implementation of this plan will allow the Department to significantly reduce the volume and burden of its internal regulations. The plan also should reduce the costs incurred by contractors to comply with contractual requirements imposed by the directives.

V.

Next Steps

The steps necessary to reinvent DOE's contracting process effectively are numerous, and will require ongoing efforts. Some recommendations in this report do not fit the many unique circumstances of all of the activities that comprise the Department's mission.[59] Implementing the plan will need to take into account the diversity of the Department's activities, since "one size" does not "fit all." The major initiatives of this plan will not be implemented until after the Department digests the feedback it obtains from its various stakeholders, as well as from Departmental personnel, during the 30-day comment period.

Implementing Contract Reform

A critical element of the contract reform initiative is changing the way the Department has traditionally approached its contracting for the management and operation of its laboratories and production facilities. The move away from specifying and measuring inputs to stipulating performance expectations and measuring and rewarding outputs is the essential component of change. As indicated in this report, this effort will be realized primarily through the use of performance criteria and measures in the Department's Performance-Based Management Contracts.

Effecting change of this magnitude is an enormous challenge. For example, in reviewing DOE's current inventory of 52 M&O contracts:

- Sixteen contracts expire by December 31, 1994. For these contracts, the extend/compete decision process is already underway.

- One contract expires on March 31, 1995. The extend/compete decision process must begin in the first quarter of calendar year 1994.

- An additional seven contracts will expire during the fourth quarter of calendar year 1995. The extend/compete decision process for them must begin during the second quarter of calendar year 1994.

Even under existing practices, the extension or recompetition of these 24 contracts represents a significant undertaking. Under the contract reform initiative, the Department's current resources in all areas of accounting, procurement, counsel, and program management will be subjected to significantly greater demands. For example, under the new contracting strategy, the number of competitive contract awards is expected to increase, thereby increasing the resources needed to conduct acquisitions.[60] Although it is impossible to calculate the additional staff, time, and financial commitments needed to fully implement the reforms outlined in this report, the need for more and better trained people in all areas of contract award and administration is clearly stated throughout this report.

The actions highlighted throughout this report and listed in the Introduction will significantly reform DOE's contracting practices and management systems. The individuals and managers of the programs specified in the list of actions will bear the primary responsibility for implementing the actions. In addition, the Department will establish a committee comprised of a cross-cutting group of senior Department managers, including the Deputy Secretary and the Under Secretary. This executive committee will:

- Evaluate the progress of individual managers in accomplishing the actions by the specified deadlines.

- Ensure that these individuals have the resources and Department-wide cooperation necessary to accomplish the actions.

- Initiate a review of each existing M&O contract, and develop a baseline to determine which contracts will benefit most from the reforms. In cases where it would not be in the Department's best interest to attempt immediately to adopt the reforms in an existing contract or to compete it, the contracts should be extended for only one or two years.

- Designate specific sites for pilot projects to permit a managed implementation of Performance-Based Management Contracts. Through these projects, the Department can apply "real-world" experience to test the applicability and cost-effectiveness of its new contracting approach, including, for example, the validity of specific performance criteria and measures and incentives.

- Require additional actions based on recommendations resulting from the studies performed by Departmental managers, in accordance with the actions required in this report.

- Identify new issues for review.

Changing the Mix of Skills at Various Sites

An important corollary to DOE's contract reform initiatives is the need for the Department to examine the mix of personnel skills at its weapons production facilities. In the past, DOE explicitly required new M&O contractors to retain the previous contractor's work force. This requirement substantially limited a new management contractor's ability to instill its own corporate culture. Moreover, many of the former weapons production facilities now have as a principal mission waste handling and environmental restoration. The workforce retention limits the new contractors' ability to change the mix of skills needed to accomplish this important new mission.

Of course, often the personnel with historical experience at a production facility can have a significant advantage over new workers in the cleanup process. It may be cheaper to retrain some of those workers than to have to train new workers in the risks and handling of waste at the site. Moreover, Section 3161 of the National Defense Authorization Act for Fiscal Year 1993 requires the Secretary of Energy to develop a plan for restructuring the workforce for a defense nuclear facility in cooperation with stakeholders, whenever there is a determination that a change in the workforce is necessary. Section 3161 provides objectives to guide the plan's preparation that are aimed at reasonable actions to mitigate the effects of workforce restructuring at defense nuclear facilities.

To balance these concerns, the Department should not explicitly require the existing workforce to be retained by a new contractor. Each new contract should inform offerors that workforce retention must be consistent with an overall plan specified by the Department. Ordinarily, the plan would include a preference for employees at the site with some seniority over new employees, where there are no significant differences between skills for the needed position. DOE should also solicit the offerors' views on how their human resources policies will ensure that they perform the work most efficiently at a site, in a cost-effective manner consistent with an overall objective of using the skills of experienced people at the site who have invested their lives in the community.

Labor/management relations need not be an impediment to seeking greater competition in the awarding of contracts. To maximize the confidence of the workers that contract competition will not be misused simply as a bargaining tool, new Performance-Based Management Contracts awarded for functions previously performed by a management contractor using unionized employees will require the new contractor to "recognize" the union certified to represent the employees performing the same work under the new contract, whenever the new contractor would be a "successor" under applicable law.[61]

VI.

Conclusion

By undertaking the actions set forth in this report, the Department of Energy will create a system of contracting that works better and costs less. These actions will:

- Minimize the potential for waste, fraud, and abuse inherent in the Department's current contracting system.
- Give the Department's contractors the benefit of clearly stated and objective performance criteria and measures, so that they will know what the Department's expectations are and will be better able to decide how to satisfy those expectations.
- Give DOE managers the information and the tools they need to manage the Department's programs effectively, particularly for managing and overseeing DOE contractors.
- Create meaningful incentives for contractors to perform better at less cost.
- Attract new competitors for DOE contracts, enlarging the pool of talented and efficient service providers to help DOE accomplish its important missions.
- Create a clear distinction between the roles of federal workers and contractors, so that the implementation of the Department's missions is firmly under federal control.

The actions that the Contract Reform Team proposes may draw criticism from many groups. The Department hopes to engage its critics and its supporters in a meaningful dialogue that, in some cases, will reinforce DOE's commitment to the actions stated in this report and, in other cases, will convince DOE that a different action is required. In the end, the Department's reformed contracting system will in fact work better and cost less, and DOE will have made a significant contribution to the efforts of President Clinton and Vice President Gore toward reinventing our government.

Endnotes

1. Appendix A describes the Contract Reform Team's structure and membership.

2. This report reflects principles articulated in Al Gore, From Red Tape to Results—Creating a Government That Works Better & Costs Less, Report of the National Performance Review, Washington, D.C., Sept. 7, 1993 (hereinafter referred to as the National Performance Review).

3. Other contracts include contracts for research and development services, architectural and engineering services, hardware and equipment, and utilities.

4. Four contractors—the University of California, Martin Marietta, Westinghouse, and EG&G—employ nearly 80,000 workers at several DOE sites encompassing 2.7 million acres and 8,300 buildings with dozens of different missions.

5. Appendix B describes in detail the history of the development of these contracting practices.

6. J. Hinkley, W. Krebs, Jr., R. Robnett, A. Jammoro, and J. Loofbourow, Report of the Advisory Board on Relationships of the Atomic Energy Commission With Its Contractors (First Rev. June 30, 1947).

7. Reimbursement of a contractor's costs under this and the other cost-type contracts described in this report is subject to Department and government-wide regulations and policies concerning reasonableness, allowability, and allocability. See Department of Energy Acquisition Regulation Subpart 970.31, 48 C.F.R. Subpart 970.31 (1992) (rules applicable to M&O contracts). See also Federal Acquisition Regulation Parts 30 and 31, 48 C.F.R. Parts 30 and 31 (1992).

8. For example, in a recent competition for the contract to manage DOE's Savannah River site, only two companies bid. Moreover, although the Department has generated considerable interest in the Idaho contract competition, relatively few of the fastest-growing, most entrepreneurial, high-technology companies and nonprofit institutions were willing to bid for that contract.

9. In addition to the fundamental problems addressed by this report, individuals who have carefully scrutinized the Department have raised numerous other specific criticisms of DOE contracting practices. Rather than simply reexamining much of this analysis, the Contract Reform Team accepted a number of these criticisms and has addressed them in this report. Many of these criticisms are summarized in Appendix C.

10. See National Performance Review, pp. 45-47.

11. Appendix D summarizes the stakeholder process.

12. See Federal Acquisition Regulation Subpart 16.5, 48 C.F.R. Subpart 16.5 (1992).

13. A recent study of the Department's Environmental Restoration program's project management found that so-called "fixed-price" contracts often are not actually fixed-price at all. Independent Project Analysis, Inc., The Department of Energy Office of Environmental Restoration and Waste Management Project Performance Study, pp. 67-70 (November 30, 1993). Appendix E includes a summary of this study.

14. See also U.S. Department of Energy, Office of Environmental Restoration and Waste Management, Benchmarking for Cost Improvement (September 1993).

15. As described in Federal Acquisition Regulation 15.903(d), 48 C.F.R. §15.903(d)(1992), certain statutory limitations are applicable to the fees for particular types of contracts, such as the performance of architect-engineering services and experimental, developmental, or research work under cost-plus-fixed-fee contracts. The Federal Acquisition Regulation specifies that deviations from the fee limitations may be authorized for cost-plus-incentive-fee and cost-plus-award-fee contracts.

16. These types of incentives are described in Federal Acquisition Regulation 16.402, 48 C.F.R. §16.402 (1992).

17. Federal Acquisition Regulation 16.402-4 recognizes this possibility, and requires that all multiple-incentive contracts contain a cost incentive or constraint that operates to preclude rewarding a contractor for superior technical performance or delivery when the costs of those results outweigh the value to the government.

18. As specified in DOE Order 5000.4A (April 4, 1992), it is the policy of the Department to allow each multiprogram laboratory to carry out a limited amount of basic and applied research and development that focuses on early exploration and exploitation of creative and innovative concepts selected at the discretion of the laboratory director.

19. This test should be conducted in accordance with the extend/compete policy, as discussed under Increasing Competition to Improve Performance in section II of this report.

20. This number includes the contract for the Superconducting Super Collider Project, which is in the process of being terminated as of the date of this report.

21. DEAR 970.1509-2, 49 C.F.R. §970.1509-3(1992), sets out a policy against the payment of management fees to educational institutions, but permits such payments if justified and approved. A significant exception is the University of California.

22. See Modifying and Improving Cost-Reimbursement Policies in section III of this report.

23. See Part 48 of the Federal Acquisition Regulation, "Value Engineering." 48 C.F.R. Part 48 (1992).

24. DOE's policies on cost sharing for contracts other than M&O contracts are contained in DEAR Subpart 917.70, "Cost Participation." 48 C.F.R. Subpart 917.70 (1992). These policies should be considered in developing policies applicable to management contracts.

25. A clause implemented recently in the University of California's contracts to manage and operate the Department's Los Alamos, Berkeley, and Livermore laboratories requires contractors to:

- Ensure that their performance protects the environment and the health and safety of workers and the public.

- Ensure that their performance is in compliance with all applicable environment, safety, and health requirements.

- Submit an environment, safety, and health program management and implementation plan within 30 days of award.

- Require subcontractors to comply with the contractor's environment, safety, and health requirements.

The same clause permits the Department to issue a "stop-work order" and to compel the contractor to take corrective action on notice of noncompliance.

26. For example, a team consisting of a Department program officer and operations officer and a management contractor may conceive a particular research project. In deciding how to implement the project, however, they would explore the full range of options among the existing DOE facilities, facilities of other government agencies, and various private-sector companies to determine who might best perform the project or research. The decision might entail noneconomic considerations, such as the need to maintain particular competencies necessary to pursue national strategic goals, but it should not presume that a management contractor whose activities originated the project or area of research would necessarily perform the activity itself.

27. The Federal Acquisition Regulation, which was published in 1984 and was designed to provide government-wide procurement regulations, sanctions the Department's use of M&O contracts (FAR Subpart 17.6), 48 C.F.R. Subpart 17.6 (1992). Because the M&O concept varies from traditional governmental standards, the FAR establishes procedures for senior-level designation of M&O contracts. FAR also recognizes the extend/compete process, which permits an unlimited number of extensions, but subjects the decision to a disciplined review prior to taking such action. See also DEAR 917.605, 48 C.F.R. 917.605 (1992).

28. For example, Allied-Signal, Inc., has operated DOE's Kansas City Plant since 1948, and Iowa State University has operated the Ames Laboratory since 1943.

29. DEAR 970.0001, 48 C.F.R. 970.0001 (1992). DOE Order 4210.5A, "Operating and On-site Service Contract Extend or Compete Decisions," 6-23-92.

30. For example, see the Actions contained in the following subsections of this report: Increasing the Use of Fixed-Price Contracts, Making Cost-Effective "Make-or-Buy" Decisions, Increasing Competition to Improve Performance, and Reducing the Use of Contracts for Support Services.

31. The so-called Section 800 Panel received its charter from Section 800 of the National Defense Authorization Act of 1992, Pub. L. No. 101-510, sec. 800, 104 Stat. 1587. This advisory panel of government and private-sector experts was charged to review all laws affecting DOD procurement, "with a view toward streamlining the defense acquisition process." The panel, which transmitted its report to Congress in January 1993, focused on three areas: streamlining, commercial items, and simplified acquisition. In addition to numerous recommendations regarding regulatory authorities, nearly 300 of the 600 laws reviewed by the panel were recommended for repeal or amendment. Legislative initiatives, some of which would have had government-wide effect, were introduced, but not enacted, last session. Legislative action is expected to resume this year.

32. For a discussion of government-wide service contracting practices, see Office of Management and Budget, Summary Report of Agencies' Service Contracting Practices (January 1994).

33. Within Headquarters alone, an estimated 1,900 contractor staff work with approximately 6,300 federal employees. Program officials often rely on these support service contractors for many daily functions and perform limited oversight. This close working relationship suggests that new federal employees could replace a number of contractors.

34. For a review and assessment of DOE's financial management structure and procedures, see United States General Accounting Office Report, Financial Management: Energy's Material Management Weaknesses Require Corrective Action (AIMD-93-29) (Sept. 1993).

35. A study conducted in Fiscal Year 1991 identified 83 Headquarters-led oversight reviews and 1,547 Field-conducted oversight reviews in a 12-month period. The Field reviews involved 87,758 staff days of reviewer effort. The study did not address the number of staff days expended by the "reviewed" organizations as they prepared for the on-site visits and responded to reports that were written. That same study found that the Nevada Operations Office alone was the subject of 28 separate reviews that encompassed 1,804 staff days of effort.

36. This strategy is similar to the Cooperative Risk Assessment Guide program used by the Defense Contract Audit Agency for its auditing of defense contractors.

37. This report does not address general cost allocation principles. A recent oral presentation by the General Accounting Office alerted the Department to perceived weaknesses in the Department's cost allocation procedures. These weaknesses would not result in a loss of some dollar amount to the government, but they could result in failure to allocate resources in accordance with statutory or Secretarial priorities. The Department's Associate Deputy Secretary for Field Management and the Chief Financial Officer are jointly being asked to make a recommendation separate from this report on this issue.

38. DOE Order 4700.1 (Project Management System), DOE Order 2200.13 (Oversight of Integrated Contractor Financial Management), DOE series of Orders 5500 (Emergency Management System), and 5480 (Environment, Safety, and Health Program for Department of Energy Operations).

39. Additionally, DOE's motor vehicle fleet consisted of 20,731 vehicles, 13,776 of which were DOE-owned and 6,955 were leased from the General Services Administration.

40. For example, a recent audit of personal property at one national laboratory disclosed that, out

of a total inventory of approximately $1 billion:

- $100 million worth of personal property may not be accounted for,
- $207 million may not be correctly recorded in the data base, and
- substantial amounts of personal property on loan to employees and other entities were at risk of unauthorized use.

This audit occurred after $11 million in property had already been determined to be lost or stolen and removed from the contractors' inventory records. See DOE Inspector General Report No. I-O-33-8, "Audit of Personal Property Management at Los Alamos National Laboratory" (December 7, 1993).

41. A series of DOE Orders governs facilities and real property managemen: DOE Order 4300.1C, Real Property Management, and DOE Order 4330.4A, Maintenance Management Program.

42. The General Services Administration is reorganizing its real estate property management functions based on benchmarking with successful private-sector organizations. A good model for this kind of benchmarking study is the Project Management Study recently undertaken by the Department's Environmental Restoration and Waste Management program.

43. In addition to providing for cost reimbursement, M&O contracts have provided indemnification for certain losses of the contractor. True indemnification is an expressed contractual obligation to make good loss or damage a contractor incurs as a result of performance of work under a contract with the government. Such provisions are based on specific statutory authority and are not subject to funding limitations. Except pursuant to statute, such as P.L. 85-804 or the Price Anderson Amendments Act, the Department has not indemnified its M&O contractors. Instead, the Department has used cost-reimbursement contract clauses to compensate the contractors for the actual costs incurred to perform the contracts. Cost reimbursement is subject to the availability of appropriated funds and is limited by specific allowability requirements.

44. The contractors were reimbursed for their costs to implement the rule.

45. See Office of the Inspector General, Report on Audit of Implementation of the Accountability Rule (January 21, 1994).

46. See Incentives for Contractor Performance, under section II of this report.

47. See DEAR Subpart 970.31, Contract Cost Principles and Procedures 48 C.F.R. Subpart 970.31 (1992).

48. This refers to civil fines and penalties. Criminal fines and penalties will continue to be disallowed.

49. Three Operations Offices—Albuquerque, Oak Ridge, and Richland—each reported contractor outside counsel expenditures in excess of $7 million for Fiscal Year 1992. Final Fiscal Year 1993 costs are likely to be in the same range. Between 50 and 75 percent of the contractor legal costs reported by these three offices is attributable to "toxic tort" class action suits filed against current and former DOE contractors employed at these sites.

50. For example, lower hourly rates with performance bonuses if counsel prevails.

51. In addition, a roundtable discussion between DOE and contractor counsel at the semiannual DOE Counsel conferences will provide an opportunity to share information and "lessons learned." Such a roundtable discussion occurred at the fall 1993 conference, and ongoing dialogue on this subject will continue.

52. See 10. C.F.R. Part 708 for a description of this program.

53. The Information Resources Management Call is the Department's annual request for information pertaining to Organizational Information Resource Management (IRM) Plans. This information supports and documents each organization's (and collectively the Department's) IRM strategy, including hardware, software, and connectivity objectives.

54. 1 U.S.C. §§501, et seq.

55. The Hanford site consists of over 350,000 acres located in the southwest area of Washington State. The principal functions now being performed at the site involve research and development and waste management to accomplish DOE's environmental restoration program.

56. Evaluation of Operations at Naval Petroleum Reserve No. 1: Report to Congress by an Independent Industry Panel, p. IV-6 (October 1993).

57. Reforms also need to be made in DOE Headquarters directives to allow the program managers within the Department the flexibility to accomplish these objectives.

58. Executive Order 12861, "Elimination of One-Half of Executive Branch Internal Regulations," dated September 11, 1993, provided specific direction to federal agencies to accomplish a 50 percent reduction in internal regulations. The Office of Management and Budget provided additional guidance on this order in October 1993, requesting that agency implementation plans be completed by December 1, with reductions to be achieved by September 1996. The DOE strategy for reducing and streamlining its internal regulations and directives is broader and more inclusive than that required by the Executive Order and the Office of Management and Budget.

59. For example, the Naval Nuclear Propulsion Program is subject to certain oversight and control requirements, as set forth in Executive Order 12344 (statutorily prescribed by Public Law 98-525, 42 U.S.C. Section 7158).

60. Using the recent Sandia and Idaho National Engineering Laboratory Source Evaluation Board experiences as examples, the competitive contracting process requires a full-time commitment of seven to nine individuals. In addition, numerous personnel from within and outside of the Department support the Source Evaluation Board as technical and financial advisors, auditors, and other subject-matter experts. As these examples show, a decision to compete a predominate number of DOE's expiring contracts will require a substantial personnel commitment.

61. The terms "recognized" and "successor" are used in the National Labor Relations Act, as amended.

Appendix A

Contract Reform Team Membership and Structure

The Contract Reform Team is comprised of 15 Department of Energy representatives, as well as three representatives of the Office of Management and Budget. The membership encompasses both political and career officials, spans a wide variety of program and administrative offices, and includes both Headquarters and Operations Office representatives. Each member has an Alternate from his or her organization.

CONTRACT REFORM TEAM MEMBERS

William White, Deputy Secretary, Chairperson
Bob Nordhaus, General Counsel, Vice Chairperson
Cherri Langenfeld, Manager, Chicago Operations Office, Vice Chairperson
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Victor Reis, Assistant Secretary for Defense Programs, Vice Chairperson
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Appendix B

History of DOE's Contracting Practices

The Department of Energy inherited its current contracting practices from the Atomic Energy Commission (AEC), which was originally established by the Atomic Energy Act of 1946. The AEC was the successor to the Manhattan Engineer District (Manhattan Project). Prominent among those practices was the use of private contractors to manage and operate government facilities. This approach enabled the AEC and its successor agencies to attract the highly specialized scientific and engineering talent from academia and the private sector that was not otherwise available to the government. These scientists and engineers worked in close partnership with the government under the cloak of secrecy and urgency to develop nuclear weapons. They also operated major scientific laboratories to advance high-energy physics, basic research, and nuclear technology.

The resulting alliance between government and industry gave rise to the development of the Management and Operating (M&O) contract. The M&O contract contemplated long-term relationships under which the contractor handled most aspects of day-to-day management, while the government paid virtually all costs and exercised only broad, general oversight.

In recent years, the focus of DOE's mission has shifted away from high-risk research and production of nuclear weapons as demand for the nuclear weapons stockpile has diminished. As weapons facilities have aged, and as health, safety, and environmental regulatory requirements have become more stringent, DOE has continued to rely on M&O contractors to maintain a safe, secure nuclear weapons complex while undertaking new environmental restoration missions. Revelations about serious and widespread environmental contamination and safety and health problems have surfaced throughout the 13-state, 17-site DOE complex, causing the environmental restoration mission to dominate many of DOE's more recent contracting activities.

DOE CONTRACTING AUTHORITY AND PRACTICES

DOE is subject to the laws and regulations that generally apply to the contracting functions of all federal agencies. These include the Competition In Contracting Act and the Federal Acquisition Regulation (FAR). Moreover, and generally within the framework of the statutes and regulations applicable to government agency contracting, a number of statutes give specific contracting authority to DOE, including the Atomic Energy Act, the Energy Reorganization Act of 1974, and the Department of Energy Organization Act.

In addition to M&O contracts, DOE awards many more typical government contracts for, for example, supplies, services, construction, and equipment. In making these awards, DOE generally follows standard government-wide competitive procedures and uses standard government-wide terms and conditions in the resulting contracts.[1]

The general statutory and regulatory framework under which DOE and other federal agencies conduct their procurements is often cumbersome, inefficient, and slow. As indicated in the National Performance Review, the federal procurement process must be streamlined.

MANAGEMENT AND OPERATING CONTRACTS

The traditional M&O contract form has been used for half a century as the primary vehicle to conduct complex government programs ranging from nuclear weapons research, development, and production, to civilian nuclear reactor development and basic scientific research. The M&O contract has permitted the government to draw upon the expertise of the private commercial sector, particularly for nuclear weapons production, and the expertise of the academic community, particularly for basic research. These programs have been carried out with a relatively small number of federal employees who have served mostly to provide general oversight, review, and programmatic direction.

The traditional M&O contract as a method of contracting is recognized in the Federal Acquisition Regulation (FAR).[2] The FAR defines an M&O contract as:

> an agreement under which the government contracts for the operation, maintenance, or support, on its behalf, of a government-owned or controlled research, development, special production, or testing establishment wholly or principally devoted to one or more major programs of the contracting Federal agency.

The M&O contract is a cost-reimbursement contract under which the government reimburses all reasonable ordinary business expenses of the contractor, subject to certain specified exceptions and limitations. The contractor is also paid a fee (fixed or award fee) or management allowance for performance of the work. In these respects, the M&O contract is similar to the standard cost-type contract outlined in the FAR and used by other government agencies.

The FAR provides that "cost-reimbursement contracts are suitable for use only when uncertainties involved in contract performance do not permit costs to be estimated with sufficient accuracy to use any type of fixed-price contract."[3] The work performed by M&O contractors historically has often been subject to many uncertainties, particularly due to the multidisciplinary nature of the research and development, or the potentially hazardous nature of the efforts involved. However, some functions performed by M&O contractors could have been awarded under separate contracts on a fixed-price basis but were not.

DOE modified its broad policy of cost reimbursement in 1991 to make certain costs unallowable for its profit-making M&O contractors.[4] The regulatory change made profit-making M&O contractors responsible for (1) fines and penalties resulting from their own negligence or willful misconduct; (2) costs, such as third-party claims, resulting from their own negligence or willful misconduct; and (3) damage to government property resulting from their own negligence or willful misconduct. However, the amount for which a contractor may be liable for unallowable costs under the "avoidable costs" rule is limited by a ceiling based on the award fee earned by the contractor. Inasmuch as relatively few costs have been disallowed under the rule and there has been no noticeable improvement in overall contractor performance or cost control, it appears that the new rule has not been particularly effective in increasing contractor accountability.

M&O contracts include very broad scopes of work, which are intended to accommodate changes in such areas as available funds, national defense needs, and the course of ongoing research. This approach permits work to continue without the need for continual detailed revisions of the scope of work.

With regard to funding and finance, the M&O contractors traditionally have functioned in closer relationship to the government than most other cost-reimbursement government contractors. Most M&O contractor organizations are separate business entities from their parent corporations, and the only work they perform is that work authorized under their DOE contracts. The M&O contractors thus have been allowed to use advance government funding through the establishment of letters of credit and special bank accounts. In order to be eligible for such advance funding, the M&O contractors are required to have established systems of accounts in accordance with DOE requirements.

The FAR also provides criteria that are to be used in determining when to use an M&O contract.[5] Although the procedures for selecting a new M&O contractor are in theory no different from the procedures followed for the selection of any major government contractor, M&O contractors have often been selected with very little competition. In fact, specialized regulations permit DOE to retain an M&O contractor to continue to perform work at a particular facility without competition.

The FAR requires contracting officers to review each existing M&O contract at least once every five years to determine whether competition for a new M&O contractor might reasonably be expected to achieve meaningful improvement in performance or cost of the work. Contracting officers are directed to consider the incumbent contractor's overall performance.[6] However, as a practical matter, despite the requirement to conduct periodic performance reviews, DOE has retained the services of many M&O contractors for relatively long periods of time, even when there have been performance problems.

ENVIRONMENTAL RESTORATION MANAGEMENT CONTRACTS

In 1992, DOE introduced a new form of contract-the environmental restoration management contract (ERMC). Like the traditional M&O contract, the ERMC is a cost-reimbursement contract and has some of the same weaknesses as the traditional M&O contract.

The new ERMC, however, was designed to promote more contractor accountability than the traditional M&O contract. For example, ERMCs do not incorporate the advance-fund method of financing that M&O contracts have traditionally used. ERMCs also incorporate the standard cost-reimbursement provisions in the FAR, as modified to include DOE's "avoidable cost" regulatory changes referred to above.

More subcontracting of on-site work is contemplated with ERMCs than with M&O contracts and DOE will not use the extend/compete process for ERMC contractors. When the period of performance of an ERMC is concluded, the expectation is that future work will be open to competition, unless one of the standard government-wide statutory exceptions to competition (for example, sole source) is utilized.

SUPPORT SERVICE CONTRACTS

Support service contracts allow the government to obtain discrete services for a specified period of time. The types of support services provided to DOE range from routine tasks (for example, janitorial services), to highly skilled, specialized studies (for example, concerning the nuclear waste program). The use of such contracts within DOE has expanded significantly within the past decade.

Support service contractors are generally selected through normal competitive procedures. For technical and administrative support services, the contracts are usually cost-reimbursement, level-of-effort arrangements in which work is directed through the use of discrete task assignments.

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[1] Negotiation procedures authorized in FAR Part 15 are primarily used by DOE for acquisition of complex systems, technical management services, and environmental restoration activities.

[2] See FAR Subpart 17.6.

[3] FAR 16.301-2, 48 C.F.R. 16. 301-2 (1992)..

[4] See *Federal Register*, June 19, 1991, pp. 28099-28110.

5 FAR 17.604, 48 C.F.R. 17.604 (1992). provides the following criteria for using M&O contracts: (a) government-owned or controlled facilities must be utilized; (b) because of the nature of the work, or because it is to be performed in government facilities, the government must maintain a special, close relationship with the contractor and the contractor's personnel in various important areas (e.g., safety, security, cost control, site conditions); (c) the conduct of the work is wholly or at least substantially separate from the contractor's other business, if any; (d) the work is closely related to the agency's mission and is of a long-term or continuing nature, and there is need (1) to ensure its continuity, and (2) for special protection covering the orderly transition of personnel and work in the event of a change in contractors.

[6] DOE's regulations expand upon the FAR provisions and require, among other things, detailed summaries and annual appraisals of the contractor's performance, including data that indicate the contractor's success or failure in meeting established program goals and objectives during the appraisal period (DEAR 917.605), 48 C.F.R. 917.605 (1992).

Appendix C

Criticisms of DOE's Contracting Practices

DEPARTMENT OF ENERGY ISSUES

The General Accounting Office (GAO) and the Department of Energy's Office of the Inspector General (OIG) have made the following criticisms of the Department's contracting practices.

Management

- Cost-plus-fixed-fee contracts are overused by the Department. Fixed-price contracts would be more effective but are not used because of the vague and overly broad work statements. (GAO)

- Controls are not in place to ensure that small and small disadvantaged business goals are achieved. (OIG)

- DOE's poor management of indirect-rate proposals causes delays in obtaining incurred-cost audits. (OIG)

- DOE does not properly implement conflict-of-interest policy or procedures. (OIG)

- DOE needs to clearly delineate the amount of award fees lost due to environment, safety, and health deficiencies. (OIG)

- Work-for-Others program's implementation of proper management controls is lacking. (OIG)

- The Work-for-Others program requires stricter management controls. In some instances, the funds are used for activities other than their intended purpose and the internal controls over the projects are extremely weak. (OIG)

- DOE uses support service contracts because it lacks the capacity to fulfill the missions itself. (OIG)

- DOE is using contractors, mostly for support services, to fulfill roles that should be performed by full-time federal employees. (OIG)

Procedures and Regulations

- DOE overuses cost-reimbursement contracts. (GAO)

- Documentation for rejecting audit recommendations based on ceiling rates and for establishment of contractor profit/fee objectives is insufficient. (GAO)

Financial Management

- DOE's contracting is vulnerable to fraud, waste, and mismanagement because the Department repays nearly all contractors' costs and does not exercise sufficient oversight of contractors' operations. (OIG)

- Conditions exist, including noncompliance with certain regulations and the contract, in the internal control structure of the prime contractors and the Department that result in a high risk that unallowable cost will be claimed by and reimbursed to the prime contractor. (OIG)

- DOE lacks assurances that its oversight and control of contract expenditures, through contract audits, will deter and detect potential fraud, waste and abuse. (OIG)

Procurement

- The Department does not always use government supply sources when purchasing goods, even though it would be both economical and in the best interest of the government. (GAO)
- Employees responsible for operating and managing major acquisitions are not fully in compliance with the documentation and reporting requirements of the Department's Project Management System. (GAO)
- The Department depends on contractors to perform vital roles. (OIG)

Contract Award

- Contracts are often inappropriately awarded because DOE officials do not follow rules and regulations properly. (GAO)
- The Department's contracts lack clear work statements and contract clauses. In addition, contracts are awarded before work is ready to begin, causing contracts to exceed their budget and time frame for completion. (OIG)
- DOE needs to improve its oversight of M&Os subcontracting, so it will be more cost-effective and efficient. (OIG)

Oversight

- Requirements under M&O contracts for unallowable costs are not enforced. DOE's contract-administrators do not comply with the terms of the contract and do not require M&O contractors to perform internal audits. (GAO)
- DOE downplays ES&H deficiencies in the award fee process. DOE places more emphasis on production rather than ES&H factors. (OIG)
- DOE's procedures for supervisors are not specific enough to ensure that contractors' use of the Federal Telecommunications System is limited to official purposes. (OIG)
- Department officials do not comply with all Office of Federal Procurement Policy procedures for designating and renewing Federally Funded Research Development Centers (FFRDC) contracts. (OIG)

MANAGEMENT AND OPERATING CONTRACT ISSUES

Subcontracting

- M&O requirements for subcontracting of Work-for-Others projects need to be streamlined. (GAO)

- M&O contractors are not closing many of their subcontracts in accordance with DEAR 904.804-1, because they are not requesting final incurred cost audits in a timely manner. (GAO)

- The sub-contracting administration and internal controls need to be improved, especially in the area of audit coverage. (OIG)

- M&O contractors have not complied with procedures and have initiated procurement actions that were not economical and were inefficient in its administering of their subcontracts. (OIG)

- M&O contractors do not always award and administer subcontracts in accordance with the DEAR and DOE contract terms. Mostly they do not ensure fair and effective competition, reasonable prices, DOE approvals, and timely closure of completed subcontracts and fail to obtain DOE approvals. (OIG)

- M&O contractors do not insure that subcontractor prices are fair and reasonable and they restrict competition by inappropriately using sole source purchases. (OIG)

Financial Management

- M&O contractors internal audits are inconsistent and unsatisfactory. (GAO)
  Department of Energy Issues

Appendix D

Stakeholder Meetings

The Contract Reform Team conducted a series of public stakeholder meetings in an effort to allow members of the public to present their views. Meetings were held at each of the Department's eight Operations Offices and in Washington, D.C. A wide variety of stakeholders, including current and potential contractors, labor unions, small and disadvantaged businesses, environmental organizations, community organizations, and academicians presented their views and comments. In addition, the Team held a Stakeholder Meeting with Congressional staff, the Department's Inspector General, and representatives of the General Accounting Office.

The candid exchange of views and forthright suggestions of all these stakeholders contributed greatly to the Team's understanding of the myriad, complex issues involved in evaluating and improving the Department's contracting policies and procedures, as well as the Team's proposals for addressing and resolving these issues.

The Department's stakeholders expressed concerns and a variety of opinions about DOE's contracting practices. Significant issues raised by the stakeholders included:

- Simplifying rules and regulations (DOE Orders).
- Improving (streamline and simplify) planning and the procurement process to reduce long lead times.
- Structuring incentives and disincentives.
- Eliminating bias toward incumbency.
- Improving the management of indirect cost.
- Providing incentives to management and operating contractors to increase the level of subcontracting with small and small disadvantaged businesses.
- Eliminating unnecessary requirements (security, undefined scope of work, and prohibitions on teaming).
- Ensuring work is done by competent, qualified personnel and companies.
- Enhancing small business participation in DOE prime contracts and subcontracts.

Many current DOE contractors feel that the Department micro-manages its activities. The contractors also expressed grave concern about the possibility of losing indemnification for their actions. Many noted that they would not subject their corporate or institutional assets to inordinate risk. These views differ greatly from congressional Office of the Inspector General and General Accounting Office stakeholders, who believe that indemnification provisions relieve contractors from the consequences of their actions to the detriment of the quality of performance and the incurrence of excessive cost to the taxpayer.

Appendix E

Office of Environmental Restoration and Waste Management: Project Performance Study

November 30, 1993

The Department's Office of Environmental Restoration and Waste Management commissioned the *Project Performance Study* to provide a quantitative analysis of how well the office plans and implements environmental remediation cleanup and waste management construction projects (DOE projects). The findings were derived by examining 65 completed and ongoing DOE projects, comparing their key characteristics and outcomes with 233 other environmental remediation projects, and 951 capital construction projects in data bases owned by Independent Project Analysis, Inc.

PRINCIPAL FINDINGS

The principal findings of the study were:

- DOE Projects for environmental remediation cost 32 percent more than those in the private sector and 15 percent more than those of other federal agencies.

- DOE Projects have an average 48 percent overrun from the authorized estimate. More important, the variability in the accuracy of the estimates for DOE Project systems was greater than that for any other organization.

- DOE Projects for environmental remediation take 18 percent longer to complete than those in the private sector and other federal agencies. DOE Projects for waste manage ment take 50 percent longer for mechanical completion than those with which they were compared.

- DOE Projects slipped their schedules by 53 percent from the start of engineering through completion, compared to an average of 16 percent for capital projects.

The study found inappropriate use of contracting strategies by DOE. For 81 percent of the environmental remediation and waste management projects in the sample, contracting practices at DOE installations allowed both a prime management and operating contractor and a prime on-site architectural and engineering contractor. Both the M&O and the A&E firms work on a cost-reimbursable basis. However, there is no mechanism between them to effectively manage the projects. Therefore, the use of multiple primes and decentralized authority limits project management effectiveness, resulting in average project management costs that are four times those of the private sector and two times those of other federal agencies. A critical aspect of the ineffectiveness of this arrangement is insufficient DOE management presence to ensure that proper requirements are established and that efficient decisions are made and communicated to the project teams performing envionmental remediation and waste management work.

It is also typical for DOE's prime contractors to subcontract large portions of work on fixed-price terms. What is unusual is that the fixed-price work is actually not as well defined as the work that remains in house with the M&O contractor under cost-reimbursement terms. As might be expected, in light of the poorer definition, the cost growth on the fixed-price tasks far exceeds the cost growth on cost-reimbursement tasks. Finally, the assignment of poorly defined tasks to subcontractors is, in effect, shifting project risk away from the prime contractors to the subcontractor, costing the taxpayers more money. In summary, DOE's contracting strategy has not been set accordig to project objectives and has not been in accord with sound practice.

A quarter of the DOE projects have significant regulatory impacts during the construction or remedial action phase because of a lack of coming to closure on project objectives by the project teams with the regulators. This resulted in additional costs and delayed schedules.

In addition, contingencies were set on informal norms or estimators' judgment, leading to contingencies that are too high (wasting money) or too low (eroding cost discipline).

RECOMMENDATIONS

1. Change contracting strategy for the Department's Office of Environmental Restoration and Waste Management projects.

   - Determine target number of DOE personnel and contractor personel necessary to perform essential owner functions for the Office of Environmental Restoration and Waste Management.

   - Set up contracting strategies according to project objectives and risks (e.g., fixed-price contracts for well-defined projects, cost-reimbursement contracts for projects that can not be well defined).

   - Enhance project controls and eliminate redundancy by avoiding the use of multiple prime contractors.

   - Regain control of essential owner functions from the contractors.

   - Place accountability of DOE and contractor managers for project performance at the project level.

2. Reform the approach to controlling project management.

   - Develop a specific measure to make the project basis comparable across the complex.

   - Set quantitative goals for improving project systems.

   - Work with DOE Operations Offices to measure and monitor the performance of project systems.

3. Overhaul the process for defining projects.

- Establish a complex-wide process for defining projects uniformly and in accordance with best practices, including appropriately coming to closure with regulators in a timely manner, and train project teams in these practices.

- Establish a project measurement program for tracking the quality of project definition for all projects.

- Use the measurements program to hold project teams accountable for achieving well defined projects prior to execution.

Appendix F

Scientific Research Performance Measures and Criteria

- Quality of the basic science, as indicated by expert advisory committees; peer reviews; sustained progress; recognition by the scientific community; and world-class research facilities.

- Relevance to DOE missions and national needs, as indicated by sustained advancement of fundamental science; programs in support of energy and other civilian technology development programs; joint efforts with industry or other government agencies, and advanced research facilities that serve the needs of a wide diversity of scientific users from industry, academia, and government laboratories.

- Construction and operation of research facilities that meet user needs and requirements, as indicated by achieving performance specifications; meeting schedule and cost milestones; operating facilities that are used for research at the forefront of science; operating reliably according to planned schedules; maintaining and improving facilities at reasonable and defensible cost; and obtaining endorse ment by strong and enthusiastic user organizations.

- Effectiveness and efficiency of research program management, as indicated by well- developed research plans; meeting budget projections and milestones; identifying and overcoming technical problems; and effective decision making in managing and redirecting projects.

SUBCRITERIA	MEASURES

DESIGN AND CONSTRUCTION OF RESEARCH FACILITIES

Criteria: Design and construction of research facilities

Achieving performance, schedule, and cost milestones as agreed to, prior to initiation of construction	The contractor and DOE agree that DOE Order 4700.1, Project Management System, provides criteria, instructions, formats, and procedures for project planning and budgeting, cost and schedule control, project change control, quality assurance, project review, status reporting, and other performance factors, and that this order also provides for the Energy Systems Acquisition Advisory Board (ESAAB), which provides formal Departmental review of all the key milestones from project initiation of design to completion of start-up procedures and that DOE Order 2200.6A, Financial Accounting, provides criteria and operating procedures for determining and allocating capital and noncapital costs.

Criteria: Use of facilities or management of their use for others

Preeminence of the facility	Is there a plan for improvements as measured, for example, by defensible requests for facility upgrades or modifications? How high is it on the M&O director's priority plan? Is there support by the Department of Energy Program Office for the improvement plans and proposals? By others? By the users? How do the operating specifications of the facility compare with other facilities worldwide? Is it unique? Is it better? Is it comparable?
Performance of the facility: Is it meeting its originally targeted performance plan?	Does it have an operating plan agreed to by the Department of Energy? Is it achieving that operating plan in terms of up time and down time, number of unscheduled outages, and the like? Does the facility meet other appropriate performance specifications like beam quality, flux, luminosity, etc.? Are the expectations of the users being met, as indicated by the opinion of user and other advisory groups?

DESIGN AND CONSTRUCTION OF RESEARCH FACILITIES *(continued)*

Criteria: Use of facilities or management of their use for others (continued)

SUBCRITERIA	MEASURES
Quality of the science: Is the research at the facility deemed to be world-class science, as measured by an appropriate peer review process? Is a reasonable fraction of the work that is supported at the forefront of the science?	Is the facility being pushed to extend its capability by users who have been deemed worthy of support? Have national and international awards been granted based on work done at the facility? Are there independent "Advisory Committees" that report to the M&O contractor's laboratory director, and is their advice considered? Is a reasonable fraction of the work that is supported in
Strength and enthusiasm of the user community: Is the community of users an important part of the scientific community at large?	What are the projections, and how well are they being met for: •Level of user activity. •Investment made by users to use the facility. •Diversity of users among university, industry, and government affiliations, including minority businesses. •Communication of research results by users, by appropriate means, such as publications and presentations. •University involvement, as indicated by the involvement of graduate students and number and quality of graduate research theses. •Industrial involvement, as indicated by the involvement of industrial users and publications. Is the contractor reaching out to new users? What are the projections for future new users, and how well are those projections being met?

CRITERIA AND MEASURES FOR SCIENTIFIC RESEARCH PROGRAMS

Criteria: Criteria that apply to all basic research programs

SUBCRITERIA	MEASURES
Scientific quality of the research: Is the research of such quality that it pushes the state of current knowledge close to its limits or makes new contributions to the field?	Results of conventional peer review and reviews across scientific sectors of research proposals and accomplishments. Progress, as indicated by sustained advancement and achievement. Quality of the research staff, as revealed by awards, high-quality publications in refereed journals, leadership in the scientific community, and the opinions of other professionals in the fields of work.
Innovativeness of the research: Has the work spawned new areas of investigation by others?	Creative and original concepts and designs for research facilities and programs. New programs spawned; new research areas highlighted. New technologies or techniques developed. Seminal papers, as judged by independent peer review.
Impact on industry: Has the work generated the interest and involvement of potential industrial partners or users?	The degree to which research tasks are directed at national technology needs. New or improved technologies are created, as indicated by industrial usage and spin-off applications. Linkage to industry through collaborations and jointly funded research efforts and the use of national experimental facilities

SUBCRITERIA	MEASURES
CRITERIA AND MEASURES FOR SCIENTIFIC RESEARCH PROGRAMS ***(continued)***	
Impact on other government agencies: Has the work generated interest and involvement of other government agencies?	Work directed in support of other agencies' known needs. Savings from identifiable consolidation. Work for others - if appropriate.

Criteria: **Criteria for multi-investigator, multi-disciplinary, integrated research programs**

Integrated program planning and review	Quality of integrated research plans. Effectiveness in forming and using interdisciplinary teams, as appropriate. Degree to which programs meet national needs and the Department's mission, as determined by outside advisory committees. Results of program reviews by Department and other stakeholder managers, covering progress, research task priorities, and personnel expertise. Outreach to industrial organizations; conferences and workshops organized and attended; conference leadership.
Efficiency of operations	Effective use of personnel, facilities, and equipment, as indicated by trends in costs. Decision making, as indicated by effective setting and changing of milestones and the ability to redirect or stop projects. Based on available resources, ability to meet program milestones. Are potential technical problems identified and steps taken to mitigate them?

CRITERIA AND MEASURES FOR SCIENTIFIC PROGRAMS

Criteria: **Criteria that apply to all basic research programs** *(continued)*

SUBCRITERIA	MEASURES
Education and training: Has the program been actively involved in promoting the educational agenda of the nation?	Graduate students and postdoctoral research staff participating in research.
	Programs for local students and high school teachers.
	Contribution to the broad education mission of the agency, which includes work to improve, nationally, science and mathematics education.
Government, university, industry cross-sector alliances: Do the programs develop and incorporate alliances that promote opportunities?	Evidence of leadership in cross-sector alliances.
	Advantageous use of cross-sector resources.
	Evidence of "economies" obtained in timing, funding, and use of infrastructure.
	Number of cross-sector temporary personnel assignments.

Appendix G

Applied Technology Performance Measures and Criteria

[redacted]

The recommended metrics for applied technology fall into four major categories. These are drawn from a longer list of metric categories developed during DOE strategic planning exercises. They represent those areas most relevant to the applied technology activities of the Department. Listed below is a summary of each category's major attributes.

- **Technology and competitiveness,** as indicated by the effectiveness of technology transfer activities, promotion of industrial competitiveness, contribution to DOE program goals, technical achievements, and cost and schedule performance.
- **Environment, safety, and health,** as indicated by compliance with all contractual, federal, state, and local environment, safety, and health requirements and by a demonstrated record of improved environment, safety, and health performance through application of new technologies and techniques.
- **Management practices,** as indicated by the effectiveness of procurement practices and contract administration, the degree to which planning activities support DOE and stakeholder needs, and the effectiveness of the contractor's Total Quality Management practices.
- **Communication and trust**, as indicated by stakeholder perceptions of the contractor's integrity, reliability, flexibility, and trustworthiness.

TECHNOLOGY & COMPETITIVENESS

Attribute: Technology Transfer & Industry Competitiveness*

Criteria	Metric
Effective use of technology transfer vehicles (CRADAs, WFOs, subcontracts, licenses, researcher exchanges, facility-use agreements, etc.) to stimulate commercialization activities by industry. *[Note: CRADAs would also use other metrics to measure contract performance.]*	Annual total CRADA and cost-shared subcontracts contributions as a percentage of annual lab budget for unclassified work. # of CRADAs and cost-shared subcontracts. # and % of CRADAs and cost-shared subcontracts that include commercialization commitment by industry. # of CRADAs and cost-shared subcontracts per research employee. Average size of CRADAs and cost-shared subcontracts. % of industry contribution (e.g., cost share). # of licenses, and % for commercial use and sale. # of WFO and technical assistance agreements and % with industry. # of exchanges and quality of exchange.
Development and execution of effective outreach programs to non-federal sector (e.g., information, technical assistance, promotion of lab's technologies).	# of agreements that result from outreach/ marketing efforts. # and type of information products delivered and contacts made with the public each year. # of information products provided to DOE for dissemination to the public (Office of Science & Technology Information, National Technical Information System,

	Federal Research in Progress). # of expressions of interest from private industry per year. Stakeholders assessment of programs effectiveness (O/G/S/M/U). # of facility-use agreements.
Development and management of intellectual property portfolio and value to U.S. industry. Special consideration given to small business (including small disadvantaged) and U.S. preference.	# of invention disclosures per research employee doing unclassified work, and % of patents that are licensed or pursued under a CRADA and cost-shared subcontracts. # of licenses. # and % of agreements with U.S. companies. # and % of agreements with small business.

Attribute: Systems Analysis*

Criteria	Metric
Effectiveness of contractor's assessment of system impacts, and uncertainties of its technology activities vs. DOE program goals.	Assessment of the competitiveness and quality of the contractor system analysis by DOE (O/G/S/M/U). Extent of stakeholder network input into contractor assessment (O/G/S/M/U).
Quality of advice the contractor provides to DOE.	Assessment by DOE of the quality and timeliness of the programmatic recommendations provided to the Department (O/G/S/M/U).

Attribute: Technical Effectiveness*

Criteria	Metric
Industry's willingness to participate.	$ & % of cost share each phase, by program, each year.
Accomplishment of work to technical specifications.	% of design specifications met in each phase, each year. Evaluation of work by DOE technical experts (O/G/S/M/U). Peer review evaluation of proposed work by technical experts (O/G/S/M/U). # of peer reviewed publications.
Cost-benefit analysis of proposed and ongoing work.	Assessment of the contractors' processes for evaluating the cost of conducting work to the benefits derived (O/G/S/M/U).

Attribute: Schedule Performance*

Criteria	Metric
Major and critical milestones completed on time (contract management reporting completed as required).	% (schedule/plan) & # of technologies completed/per phase/each year/per program. # and % of milestones by type (contractors, Field, Headquarters, external) completed per reporting period. Milestones completed ahead of time. # of contract reports submitted vs. scheduled.
Demonstrated ability of the contractor to initiate and implement the necessary actions for schedule recovery.	# & % reprogrammed milestones by mutual consent.

Attribute: Cost Performance and Cost Quality

Criteria	Metric

Cost targets achieved.	$ and % variance of cost during reporting period.
	$ and % variance in actual vs. projected cost each year, for each program.
	$ and % obligated vs. planned cost per reporting period.
	DOE managers' assessment of contractor performance in meeting cost objectives.

Quality of work cost estimates.	% change in original cost estimate.
Contractor-initiated cost savings.*	DOE evaluation of contract's cost savings achieved vs. the contractor's plan for achieving cost savings through efficiency and cost-effectiveness (O/G/S/M/U).

ENVIRONMENT, SAFETY AND HEALTH

Attribute: Environment, Safety, and Health Performance

Criteria	Metric
Compliance with all contractual, federal, state, and local requirements as regards environment, safety, and health.	Statistics on accidents and occurrences. # of OSHA violations each year. # of lost work days. # of environmental violations each year. Program managers' assessment of effectiveness (O/G/S/M/U).

MANAGEMENT PRACTICES*

Attribute: **Procurement Effectiveness**

Criteria	Metric
Cycle time.	# or % of milestones met.
Subcontracting goals.	% of procurement goals achieved each year.

Attribute: **Administration Effectiveness***

Criteria	Metric
Overhead (people and dollars as a portion of the whole).	Ratio of technical/(technical + administrative costs).

Attribute: **Effectiveness & Relevance in Planning***

Criteria	Metric
Industry involvement in program and project planning.	Increase in opportunities for input.
Contractor planning effectively supports implementation of DOE goals.	DOE evaluation of quality and comprehension of systems evaluation. Stakeholder satisfied with opportunities for input in planning process (O/G/S/M/U).
Providing program assessments and recommendations to DOE concerning system impact and stakeholder needs.	DOE evaluation of program plans vs. goals (in consultation with input from stakeholder).

Attribute: **Total Quality Management (TQM) Performance**

Criteria	Metric
Superior business practices. Customer focus and satisfaction. Leadership. Management of quality processes. Human resource development and management. Quality and operational results.	Results of stakeholders survey (e.g., impacts of performance improvement activities on cost, time, quality).

COMMUNICATION AND TRUST*

Attribute: **Quality of the M&O as a Partner with its Stakeholders**

Criteria	Metric
Integrity.	Results of stakeholders' survey (O/G/S/M/U).
Reliability.	Degree of stakeholders satisfaction.
Flexibility.	# of ethic/integrity violations each year.
Trust.	Number of complaints and sustained protests by stakeholders each year.

In summary, we propose a performance evaluation process that integrates Departmental strategic goals, program objectives, laboratory visions, and contractor activities.
Performance criteria/measures and incentives are useful measures of assessing contractor effectiveness only to the extent that the contracting activity to which they relate is relevant to the Departmental and programmatic goals. To optimize departmental effectiveness in applied technology, this performance evaluation process must be used for all applied technology efforts, regardless of where they are conducted within the Department's laboratory complex.

DELIVERABLES

Process for establishment of M&O performance metrics.

We will develop a process to establish performance metrics for applied technology efforts, that begins with the strategic goals of the DOE Program Office. From this, the process will derive broad M&O contractor goals, laboratory objectives, a Performance Evaluation Plan specifying performance criteria and metrics, and finally a structure for laboratory Field Work Proposals that include very specific performance assessment measures for specific applied technology tasks.

M&O performance metrics for applied technology tasks.

We will develop representative performance metrics to be used in laboratory Performance Evaluation Plans. Applied technology metrics will address the needs of technology stakeholders for commercialization of technology across the stages of technology development, from applied research through exploratory development, engineering development, demonstration, and operability testing.

Application of performance metrics to applied technology M&O contracts.

Following a pilot test at a specific laboratory of the performance metric process and its application, we will apply the process to all M&O contractors executing applied technology programs.

Schedule

M&O performance metric process completed	July 1994
Representative M&O performance metrics completed	December 1994
Performance metrics used by all applied technology M&Os	July 1996

Owner

M&O performance metric process	Energy Efficiency and Renewable Energy
Representative M&O performance metrics	Energy Efficiency and Renewable Energy
Performance metrics used by all applied technology M&Os	Office of Field Management

Appendix H

Defense Programs Performance Measures and Criteria

Defense Programs Performance Measures and Criteria

The Office of the Assistant Secretary for Defense Programs and the Office of Intelligence and National Security, in cooperation with other affected Departmental organizations, developed a Strategic Plan for National Security activities of the Department of Energy that identifies strategic objectives, prioritizes its activities, and will serve as a basis for future budget and contracting activities. As part of that activity, a number of performance criteria and metrics have been identified for use in both self-assessment and assessment of contractor performance. These performance criteria and metrics are based, in part, on the President's Quality Award Program, which is an adaption of the Malcolm Baldridge National Award Criteria, and reflect the total quality philosophy of these award programs and on specific programmatic objectives developed in the strategic planning process.

The performance criteria and metrics identified in the appendix reflect the thinking to date of the group who developed the National Security Strategic Plan and will be expanded and refined as the Department moves to include more specific performance criteria and metrics in its contract vehicles. Not all of the performance criteria and metrics will be applicable in all contracts. Performance criteria and metrics have been developed for (1) five specific program Focus Areas within the November 1993 National Security Strategic Plan and (2) general management.

FOCUS AREA: STEWARDSHIP OF THE U.S. NUCLEAR WEAPONS ENTERPRISE

Strategic Goal: Maintain nuclear weapons technology and competence that are responsive to national security needs—within expected fiscal constraints.

Criteria	Metric
Ensure that the stockpile is safe, secure, reliable, and flexible without underground nuclear testing.	Variance from schedules for stockpile surveillance evaluations.
	Variance from schedules for regular maintenance requirements.
	Cycle time to respond to unanticipated stockpile problems.
	Variance from schedule as the facilities in the stockpile stewardship program are designed, constructed, and activated.
	Variance from schedules for hydronuclear experiments to assess reliability and safety of all weapons and for high-fidelity flight tests as part of an enhanced stockpile surveillance program.
	Variance from schedule to complete the archiving of relevant data and experience on each weapon in stockpile.
	Ability to match past tests with experiments in new facilities.
	Effectiveness of program to train and mentor scientists, engineers, and technicians to ensure a cadre of future weapons experts.
	Compliance with environment, safety, and health requirements.
	Success of 3-D codes to evaluate experimental results.
	Time reqired to return to underground testing, if needed.
	Periodic assessments of the professional competence of scientific and technical staff.

Criteria	Metric
Provide the ability to respond to continuing and evolving nuclear threats.	Number of emergency-response field actions regularly conducted, and tabletop exercise in between, to evaluate capability with improved equipment and procedures.
	Improvements in nuclear sensor and search capability.
	Degree to which DOE's threat assessment and recommendations are accepted in the inter-agency process.
	Degree to which DOE's advanced developed equipment is adopted to detect development and products of nuclear weapons.
	Adequacy of technology demonstration programs designed to counter continuing and evolving threats.
Enable a reduction in the size of the production infrastructure and its environmental impacts.	Progress in the waste minimization plan.
	Evaluation of success of new equipment and improved processes and facilities.
	Reduction in time needed to complete material control accounting functions.
	Success in transferring new technologies.
	Implementation of environment, safety, and health improvements, including Defense Nuclear Facilities Safety Board recommendations.
	Dollars invested per weapon in stockpile.
Ensure availability of special nuclear materials and tritium.	Number of warheads red-lined due to lack of tritium.
	Variance in schedule in determining the technology for future tritium supply.
	Variance in schedule to activate the capability to produce future tritium.
	Assessment that stored material conforms to the nuclear weapons stockpile plan.

Criteria	Metric
	Assessment that storage of materials and components conforms with safety, security, and environmental requirements.
	Variance in schedule for deployment and activation of "Complex 21."

FOCUS AREA: DRAWDOWN AND DISPOSITION

Strategic Goal: Reduce nuclear stockpiles by safely dismantling thousands of nuclear weapons. Support safe disposition of nuclear materials and components that could contribute to proliferation by providing capabilities, technologies, and systems.

Dismantle excess nuclear weapons, in accordance with national policy and international agreements, and provide safe, secure, and verifiable processing and storage of the resulting nuclear materials and components.	Degree to which DOE capacity for dismantlement meets U.S. policy requirements (measured by National Security Council and Department of Defense).
	Extent to which DOE performance has met its commitments (variances from stockpile plans).
	Number of environment, safety, health, and security-related incidents associated with dismantlement activities.
Seize all opportunities to work with the Russians and others to reduce, eliminate, and prevent the spread of nuclear weapons, materials, and expertise.	Congressional, executive branch, and public recognition of DOE leadership in programs designed to reduce the danger of contributions to ptroliferation by the former Societ Union.
	Number of effective collaborations and relationships with foreign countries that support U.S. nonproliferation objectives.
Implement credible, cost-effective technologies, capabilities, and systems for storage, conversion, and eventual disposition of all forms of nuclear weapons-capable materials. Honor U.S. nonproliferation policy commitments.	Quantity of weapons-capable nuclear material that is accounted for in U.S. or worldwide nuclear material control and accounting schemes.
	Quantity of weapons-capable nuclear material for which there is an accepted long-term disposition plan.
	Fraction of material that has undergone disposition.

Criteria	Metric
FOCUS AREA: TECHNOLOGY INFRASTRUCTURE AND CORE COMPETIVENESS	
Strategic Goal: Achieve continual enhancement of the technology infrastructure and core competencies for execution of the national security mission while further assisting industrial competiveness.	
Develop the technology infrastructure and multipurpose facilities to support the core competencies needed to execute the national security mission, while further assisting industrial competitiveness.	Quality of program, as measured by review groups.
	Quality of technical programs, as measured by citations, including Industrial Review "Top Ten" and other awards.
	Number of proposals for partnerships, and a reduction in the processing times for partnerships.
	Comparison of overlap of technology infrastructure with industrial competitiveness requirements.
Orient technology programs to solve deficiencies in operational safety, environment, health, and security.	Status of benchmarking.
	Reduction in the number and quantity of environmentally harmful chemicals and compounds released that can be traced to the reorientation of advanced technologies.
	Number and scope of deficiencies in plant operations/activities that are identified and resolved by technology.
	Identification of research and development efforts as origin of solutions identified for reducing harmful releases and operational deficiencies.
	Reduction in the number of injuries to plant workers that can be traced to advanced technologies.
	Reduction in the number of claims filed against DOE for violations of environmental and safety statutes that can be traced to the reorientation of advanced technologies.

Criteria	Metric
Produce "dual benefits" trough joint efforts with other DOE programs, other agencies, industry, and other countries.	Quality of investment strategy and programs.
Assist DOE in fulfilling its other objectives by the use of DOE security assets.	Number of technologies transferred from the weapons programs to other DOE organizations, e.g.: • Improved fuel efficiency through new plastics, ceramics; • New methods to discover and extract natural resources; and • New technologies to deal with transuranic wastes. Number of facilities used (and paid for) by other programs, both government and private. List of satisfied customers. Impact on science and math education in Defense Programs communities that can be attributed to the use of DOE national security assets.

FOCUS AREA: RESTRUCTURING OF THE DOE NATIONAL SECURITY ENTERPRISE

Strategic Goal: Transform the DOE national security infrastructure to meet all current and future requirements for (1) management of nuclear weapons design, testing, and manufacturing technology; (2) weapons-capable materials; and (3) maintenance of arms control and related technologies. Make the infrastructure cost-effective, responsive, flexible, agile, and environmentally responsible.

Criteria	Metric
Implement promptly a restructuring plan.	Is the complex smaller, less diverse, more cost-effective, and environmentally responsible? Percentage of equipment relocated, facilities modified, construction completed, or processes qualified at receiver sites against plan for nonnuclear consolidation. Office of Management and Budget and congressional support for budget requests and outyear funding requirements needed to complete the approved plan.

Criteria	Metric
Establish flexible processes that demonstrate very short-cycle and cost-effective design, development, and manufacturing to respond to changes in customer demand.	Ability to meet dismantlement, retrofit, and production requirement to delivery of first production unit.
	Percentage of complex design/production projects that reflect application of concurrent engineering processes, ensuring that output considers both design and manufacturing parameters.
Ensure prompt identification and effective transfer process for excess facilities.	Number and significance of excess facilities still under national security programs, even though no longer needed.
	Variance from approved schedule for transferring facilities to appropriate entities.
	Redeployment of national security resources from excess facilities to ongoing responsibilities.

FOCUS AREA: NONPROLIFERATION AND ARMS CONTROL

Strategic Goal: DOE will be a full participant in preventing the spread of nuclear weapons, materials, and expertise, and the preeminent agency in providing the technology to do this.

Develop and maintain a preeminent research and development program that anticipates nonproliferation, counterproliferation, and arms control needs.	Frequency with which customers call on DOE for support.
	Number and quality of research and development initiatives completed/applied, and the time from concept to application.
	Percentage of R&D for which there are specific applications and customers.
Provide quality intelligence assessments on scope, status, and potential threats of proliferation of weapons of mass destruction.	Frequency with which customers judge DOE intelligence products to be timely, credible, and relevant.
Provide a preeminent technical and analytical capability to support national security policy formulation.	Frequency and level in which DOE participates in interagency nonproliferation and arms control policy planning and decision fora.
Develop and implement an effective, efficient, worldwide emergency management and response capability for incidents affecting national security.	DOE's emergency management system is adopted as the international standard for responding to nuclear incidents.

Criteria	Metric
Develop the capabilities, technologies, and systems to create, anticipate, and explain opportunities for international nuclear weapons and special nuclear materials control and accountability and to support arms control treaty monitoring.	Number of times DOE's knowledge, technologies, or systems are used in the international arms reduction and verification monitoring arena.
	Frequency and degree with which customers ask DOE to contribute to international safeguards and control activities.
Provide an environment that promotes a measurable increase in personal and organizational development.	Design of management commitment to creating and sustaining an organizational vision and customer focus orientation.
	Effectiveness in communicating clear and visible quality values.
	Degree to which data, information, and measures are valid and used to drive quality and operational improvement.
	Degree to which the workforce has been empowered to develop its full potential.
Demonstrate results from the continuous improvement in program quality.	Degree to which quality requirements are integrated in overall planning.
	Results of surveys of customers on Defense Programs' satisfaction of their needs.

Appendix I

Environmental Restoration and Waste Management Performance Measures and Criteria

The Office of Environmental Restoration and Waste Management (EM) is developing performance measures and criteria for use in contracts within the framework of six major goals in the EM Strategic Plan. These goals are to:

1. Manage and eliminate the urgent risk threats in our system.
2. Provide a safe workplace that is free from fatalities and serious accidents, and continuously reduces injuries and adverse health effects.
3. Change the system so that it is under control managerially and financially.
4. Be more outcome oriented.
5. Focus the technology development program on DOE's major environmental management issues, while involving the best talent in DOE and national (public and private) science and engineering communities.
6. Develop strong partnerships between DOE and its stakeholders.

EM is developing a performance measurement system that integrates measures with the planning, budgeting, and contracting processes. EM will develop its measures using a top-down/bottom-up (e.g., Headquarters/Operations Office) approach.

The attached contract performance measures and criteria tied to the major program goals are intended to be illustrative. These measures and criteria will be refined based on stakeholder comments and additional Departmental input.

NOTE: The following measures and criteria are dynamic. They are in a continual refinement

Goals	Criteria	Measures
Goal 1: Manage and eliminate the urgent risks and threats in DOE's system.	Reduce the major safety risks posed by the Hanford high-level waste tanks' flammable gases.	Prevention of the accumulation and release of flammable gases within X number of Hanford's tanks (such that the concentration in each tank's dome space does not exceed 25% of the lower flammability limit).
	Complete implementation of the DOE Spent Fuel Management program. Incorporate specific milestones identified with accomplishing this objective in the annual operating plans referenced in the contract to mitigate the urgent risks associated with spent fuel in Hanford K-Basin and Idaho CPP 603.	Contract payment incentives will be based upon required completion of milestones in accordance with the established schedule and within budgeted costs. In addition, award fee will reward a specific level of reduction in the Defense Nuclear Facilities Safety Board's recommendations for the Spent Fuel Management program (with a final goal of zero recommendations).
Goal 2: Provide a safe workplace that is free from fatalities and serious accidents, and continuously reduces injuries and adverse health effects.	Develop a workforce that is competent, proficient, accountable, and committed to safety and health. Incorporate within contract statements of work mandatory and desirable safety and health training curricula for senior and mid-level managers and workforce. The expectation is that 75% of employees will complete safety and health and RadCon training curricula, as defined by contract language within six months of the course's availability.	Safety and health required-training curricula are operating by December 1995, in accordance with contract requirements.
	Identify and mitigate hazards at EM dfacilities. Reward or penalize the contractors based on their specific actions to identify and correct workplace hazards.	Contract incentive payments will be based on: • Reductions in lost-time injury rates and lost work day statistics.

Goals	Criteria	Measures
		• Annual percentage reductions in Occupational Safety and Health Administration recordable injury rates, based on calculated yearly improvements.
Goal 3: Change the system so that it is under control managerially and financially.	Include the requirement (in operating plans for contracts and their award fee evaluations) to baseline projects within the time frames necessary to meet the deadlines in the Defense Authorization Act of 1993. Baselines must be realistic and must include the cost, schedule, and technical details to perform and manage EM's work.	Cost and schedule outcomes and the attainment of cleanup goals will be measured against baselined/contract-stated amounts with incentive payments based upon resulting variances.
	Contracts will include firm requirements for the contractors to be cost-effective and to identify and implement contract cost reductions associated with savings.	Bottom-line contract cost reductions (while maintaining the quality of work) will be measured. There will be provisions for contractor fee increases for additional reductions realized above the contract-specified amounts.
	Major EM contractors will be contractually required to maintain program/project management systems that are capable of supporting the development of verifiable, realistic, original cost estimates and costs to complete.	Variances from budgeted project cost estimates will be measured, with adjustments made to award fee based upon established amounts per dollar level of change.
	Contractors will provide accurate financial and project-control information to the Field Office within a contract-specified number of days after the close of the accounting period. The target is to achieve near real-time submission dates for data when feasible.	Contractors will provide financial and project control data and reports within the specified number of days after the accounting period ends. Specific measured delay periods beyond the dates specified will be penalized.

Goals	Criteria	Measures
	Mandatory contract-reporting requirements must include accurate disclosure of cost and schedule information that is adequate to facilitate government oversight.	Accuracy of the contractors' data will be assessed during monthly reviews and periodic on-site audits.
Goal 4: Be more outcome oriented.	EM contracts for cleanup work must include both contractor risk for performance results that accomplish contract decontamination standards and also incentive payment for exceeding required results within contract cost limitations.	Contract incentive payments will be based upon contract-stated levels of improvement over preestablished cleanup, cost, and milestone accomplishments.
	For projects that generate wastes, include in the contract a specified target percent reduction in waste generated per unit of output in full compliance with all regulatory requirements (e.g., Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)).	Percent reductions in wastes generated per unit of output (for programs that generate wastes), as specified in contract work statements.
Goal 5: Focus the technology development program as DOE's major environmental management issues while involving the best talent in the DOE and national (public and private) science and engineering communities.	Contracts must include both requirements and incentive payments for contractor-identified technology innovation related to the solution of program objectives.	Contract provisions will authorize reimbursement to stated limits for technology innovation that is validated to be relevant to EM program objectives.
	Technology development contracts must require a designated level of expertise to ensure cost- and technically efficient solutions to EM program objectives.	Contract incentives will authorize stated cost and fee payments for technology development accomplishments that constitute new technology or value engineering enhancements, as defined in the contract provisions and are validated as solutions to program

Goals	Criteria	Measures
		objectives and related to contractor decisions to use senior-level expertise.
Goal 6: Develop strong partnerships between DOE and its stakeholders.	Contract deliverables must include requirements to integrate consensus views of stakeholders.	Contract deliverables will require contractor integration of stakeholder views in report products, as directed by EM program managers. Acceptance of reports will be based upon a measured level of coordination on consensus views that are identified by the government for contractor integration into the documentation.

Appendix J

Business Management Performance Measures and Criteria

The following performance measures and criteria for various business management areas are samples of those to be used both in self-assessment and in the assessment of contractor performance. They will continue to be refined, updated, and expanded to ensure effective, site-specific business management oversight. Several of the measures are already being used as part of currently approved DOE documents and contracts (e.g., *Personal Property Management Systems Appraisal Guide*).

FINANCIAL MANAGEMENT

- Contractor indirect and direct budget submissions are completed in accordance with the guidance provided and DOE orders, are submitted by the requested due date, and require minimal work.
- All costs for Work for Others programs will be within sponsor limits.
- Required periodic financial reporting, such as the Quarterly Safeguards and Security Financial Report, are submitted as scheduled, are accurate, and are consistent with other reporting requirements.
- Outlay estimates are planned with sufficient accuracy to negate periodic revision reporting.
- Indirect cost pools are managed to adhere to the negotiated overhead amounts and rates.
- Direct and indirect costs can be fully allocated by the laboratory's financial system.
- The laboratory's commitment system captures all commitments against available funding.
- Policies and procedures are in place that ensure that the correct type of obligated funding is committed to each activity.
- Financial system implementation issues are quickly identified and promptly resolved with appropriate notification to DOE.
- The contractor's cost management practices result in the projected threshold variances and are promptly brought to DOE's attention and justified.

- Monthly Financial Information System reporting is accomplished promptly and accurately with minimal need for corrections as the result of DOE edits.
- Accounts receivable aging, reporting, and control are maintained within DOE guidelines.
- Funds are used for their intended purpose, as stated in Financial Work Plans and other cross-cut/special-purpose reports and project data sheets.
- A Cost Accounting Standards Disclosure Statement will be submitted whenever cost accounting practices that require disclosure are revised. All cost-accounting practices in accumulating and reporting contract performance cost data will be consistent with this statement.
- The annual Voucher Accounting for Net Expenditures Accrued will be submitted by the date prescribed by DOE.
- Policies and procedures are documented, current, and readily available.
- Average daily balances in the letter of credit are maintained as close to zero as possible.

PERSONAL PROPERTY

The DOE *Personal Property Management Systems Appraisal Guide*, which includes identifiable performance management criteria, should be reviewed to assess its applicability. The measure should be used as the basis for laboratory quality self-assessments and annual assurance memoranda. Sample measures:

- Required capital-equipment and sensitive-item inventories actually performed, including timely analysis and response to identified problems.
- Dollars and percentages saved annually due to reuse (actual amounts and related amounts to previous year).
- Accomplishments in attaining annual motor vehicle criteria.
- Use of usage data to manage motor vehicle fleet size.
- Innovative practices implemented related to management of personal property, including motor vehicles.
- Use of state-of-the-art technology in the management of personal property.
- Identified continuous improvements in the management of personal property and motor vehicles through the implementation/use of quality self-assessments.
- Contractor participation on DOE personal property/motor vehicle reviews.

HUMAN RESOURCES

Human Resource Programs: Contractor human resource policies and procedures are developed and administered in accordance with the Federal Acquisition Regulation (FAR), DOE Acquisition Regulation (DEAR), the contract, industry standards, and good business practices that support project goals and objectives in a cost-effective and timely manner.

Risk Management: Contractor worker compensation and casualty insurance programs make judicious use of government funds through adequate case management, control of reserves, and appropriate oversight of third-party administration.

Benefits Programs: Contractor benefit programs to include health and welfare plans and pension programs do not exceed industry standards and normative costs and are integrated with compensation to ensure the reasonableness of costs overall to the organization.

Labor Relations: Contractor labor-management relationships are managed consistent with all applicable laws and DOE policies. Settlements are reasonable when compared to national data sources and comparative settlements within the DOE complex.

Human Resource Development and Training: Contractor human resource development and training programs are consistent with DOE policies, integrate both federal and other contractor resources, and are implemented in a systematic and orderly management process consistent with industry practice, contract language, and DOE policies in support of DOE missions.

Compensation: Contractor personnel costs are managed applying a total compensation approach to the management of personnel costs to include compensation systems. These systems provide for judicious expenditure of government funds and reasonable wages and salaries that attract and retain a competent and productive work force, while relating compensation to the performance and contract work.

Manpower Management: Contractor management of manpower usage is conducted cost-effectively through appropriate planning for resource requirements, allocation of resources across projects and mission changes, and cross-utilization of resources interorganizationally.

Diversity Improvement: Progress in improving organizational diversity by meeting or exceeding targeted goals that are based upon availability statistics is demonstrated annually. Inability to achieve goals is identified early on in the year, notification to DOE is timely, and appropriate alternative courses of action are implemented.

Appendix K

Environment, Safety, and Health Performance Measures and Criteria

Performance measures are essential to the successful implementation of the Department of Energy's Contract Reform Initiative. Environment, safety, and health performance measures and criteria must go beyond mere compliance with regulations and requirements to establish common expectations for cost-effective, comprehensive programs related to environment, safety, and health. These performance measures and criteria will be both process-related and outcome-based.

Environment, safety, and health (ES&H) performance measures and criteria will be established to provide needed information to evaluate contractor performance and management commitment. The following performance measures and criteria are intended to be a blueprint that can be modified and strengthened for each DOE program area. Apart from the performance measures and criteria is a set of results or outcomes that need to be tracked and reported at the Headquarters level. However, these results are only an input to evaluating performance and may include:

1. *Reduction in workers' compensation costs (per employee).*

2. *Number of Class A incidents (per employee).*

Trends in workers' compensation costs and number of Class A incidents are used by industry as a measure of the frequency and severity of accidents. Indications of an organization's overall attitude toward ES&H are also possible.

3. *Number of repeat occurrences and time frame for addressing them.*

Management direction and involvement relative to ES&H can be measured by an analysis of the number of repeat or similar occurrences and the time frame necessary to abate identified hazards or address underlying issues. An organization's ability and commitment to resolve identified problems can also be measured.

4. *Number and severity of notices of environmental violations (including fines and penalties).*

5. *Reduction in environmental releases, as reported by the Toxic Chemical Release Inventory.*

Mission-specific and site-specific ES&H performance measures will also need to be developed. The following could serve as a template or starting point for the development of such measures. In any event, it is expected site-specific measures will be significantly more ambitious when related to a particular operation.

PERFORMANCE OBJECTIVE 1: PROTECTION AND PREVENTION

The "facility" will conduct operations safely to prevent harm to health, the environment, and the public. (Weight = 30%)

Criteria

1.1. An effective Environment, Safety and Health Program will identify, control and respond to hazards. The intent of the following group of performance measures is to assure that the facility's

ES&H systems effectively address protection and prevention. They represent key protection and prevention elements intended to demonstrate the effectiveness of ES&H systems. (Weight = 30%)

Performance Measures

1.1.a. RADIATION PROTECTION: Public and occupational radiation doses from DOE operations will be measured or calculated to assure that applicable Federal limits are not exceeded. The collective occupational radiation dose will not exceed 95% of the 5 year running average of the collective occupational dose for a facility. Any actual or anticipated significant change in workloads will be brought to the attention of management as soon as possible and an appropriate change may be made in this goal. For purposes of this goal, significant should be interpreted to be a change of 10% (or more) in workload that would affect radiation dose or toxic exposures.

1.1.b. EXPOSURE PREVENTION: The number of reportable occurrences of radiation and toxic chemical exposure will be tracked. A decreasing trend is expected.

1.1.c. ACCIDENT PREVENTION: Severity, frequency and lost work time of accidents will be analyzed to identify the major personnel accident types. These causes or precursors will be corrected immediately and tracked/trended.

1.1.d. WASTE MINIMIZATION: Jointly, DOE and facility management will select process waste streams that were the highest generators of waste (hazardous, low-level waste, transuranic, or mixed). The facility will reduce the rate of production of these wastes by an average of 25% per year. In addition, the Facility will decrease the aggregate weight of all waste generated sitewide by 30% per year. Any actual or anticipated significant change in workloads will be brought to the attention of management as soon as possible and an appropriate change is to be made in this goal. For purposes of this goal, significant should be interpreted to be a change of 10% (or more) in workload which would affect waste generation rates.

1.1.e. MEDICAL AND INDUSTRIAL HYGIENE INTERFACE: The medical staff will have an interactive relationship with the industrial hygiene department and actively participate in workplace hazard assessments as demonstrated by the quality of workplace interactions such as individual or group workplace assessments, review of industrial hygiene monitoring results, involvement in respiratory protection, hearing protection, training, engineering and administrative controls.

1.1.f. TOXIC RELEASE INVENTORY: By a date to be established, the facility will demonstrate an effective and functioning toxic release inventory (TRI) program to DOE that will provide the required data for the preparation of the annual TRI report.

PERFORMANCE OBJECTIVE 2: COMPLIANCE

The facility will comply with applicable federal, state, and local ES&H laws, regulations, and ordinances and with applicable DOE directives. (Weight = 20%)

Criteria

2.1. The facility will have effective programs in place designed to achieve compliance with applicable federal, state, and local laws, regulations, and ordinances and with applicable DOE orders, as provided in the prime contract. The intent of the following performance measures is to ensure the facility's ES&H systems effectively address compliance. They represent key compliance elements that are adequate to demonstrate the effectiveness of ES&H compliance systems. (Weight = 10%)

Performance Measures

2.1.a. TRACKING AND TRENDING OF FINDINGS AND VIOLATIONS: The number of validated environmental violations and findings resulting from inspections by regulatory agencies and formal audits will be tracked and trended by statutes or agency. A downward trend is expected for each category from the base year.

2.1.b. TRACKING AND TRENDING OF ENVIRONMENTAL RELEASES: The mean time between reportable occurrences of environmental releases exceeding regulatory or permitted levels imposed by local, state, or federal agencies will be determined and trended. An upward trend is expected.

2.1.c OCCUPATIONAL SAFETY AND HEALTH: 100 percent of imminent-danger situations as defined by Section 13(a) of the Occupational Safety and Health Act will be mitigated immediately upon discovery. Serious violations, as defined by Section 17(k) of the Occupational Safety and Health Act, will be mitigated or corrected within five working days or in accord with a schedule agreed to by DOE.

Criteria

2.2. The facility will be responsive to regulatory agencies. (Weight = 10%)

Performance Measures

2.2.a. REGULATORY COMMITMENTS: The rate of compliance with funded regulatory consent agreement milestones will be tracked and trended. A rate of 100 percent is expected. If such milestones cannot be met, the facility must inform DOE in writing at the earliest possible time before the milestone passes and must seek written concurrence from the appropriate regulatory agency on a revised schedule.

2.2.b. RESPONSE TO REGULATORY AGENCY REQUESTS: Responses to agreed upon regulatory agency requests will be on time, or new due dates will be requested from the agency prior to the original due date.

PERFORMANCE OBJECTIVE 3: INTEGRATION AND ACCOUNTABILITY

The facility line management is accountable for integration of ES&H programs in all operations. (Weight = 35%)

Criteria

3.1. The managers of facility projects properly plan and execute projects with due regard for ES&H issues, such that adverse consequences relative to ES&H can be prevented, and additional costs relative to addressing ES&H issues will be managed effectively. (Weight = 5%)

Performance Measures

3.1.a. INTEGRATION: The facility will develop in FY 95 a comprehensive management system that ensures that Line and Project/Program Managers integrate applicable ES&H concerns into their functions and program projects during the conception, design, execution, and all final disposition phases. A pilot of the program will be in place no later than August 1, 1994, with full implementation based upon the results of the pilot by October 1, 1994. Full implementation will include the use of quantifiable performance measures in FY 95 as part of the performance assessment process.

Criteria

3.2. Timely, accurate, and complete ES&H budgetary and planning information and required reports submitted to DOE. (Weight = 20%)

Performance Measures

3.2.a. COMPLETION OF MILESTONES: Recurring ES&H budgetary and planning information and reports required by DOE will be submitted in accordance with schedules established. The rate of completion of commitments will be tracked and will be equal to or greater than 95 percent.

Criteria

3.3. Each facility will clearly define and communicate roles, responsibilities, and authorities. The intent of the following performance measure is to minimize confusion regarding ES&H roles, responsibilities and authorities and to aid in holding staff and managers accountable. (Weight = 2%)

Performance Measures

3.3.a. ACCOUNTABILITY: Roles, responsibilities, and authorities with regard to ES&H matters will be defined, documented, and assigned for functional and line organizations to levels that have management responsibility, authority, and accountability and will be current within 60 days of any changes in organization or responsibilities.

Criteria

3.4. Conduct of operations principles are integrated into facility operations. (Weight = 10%)

Performance Measures

3.4.a. TRAINING: The facility will document sitewide training requirements for conduct of operations and occurrence reporting and train all employees who work in category 2 and category 3 nuclear facilities and high-hazard and moderate-hazard nonnuclear facilities by a certain date.

3.4.b. SELF-ASSESSMENT: The facility will perform a self-assessment of conduct of operations implementation by a date certain and will revise site-specific implementation plans with current milestones by a date certain. This assessment will establish the baseline by which future improvements will be measured.

3.4.c. CORRECTIVE ACTIONS: Corrective actions, as detailed in final Occurrence Reporting System reports will be completed on or before the target date 95% of the time.

PERFORMANCE OBJECTIVE 4: RISK REDUCTION

The facility will ensure that for its operations, ES&H risks are analyzed, and risk-reduction resources are allocated appropriately. (Weight = 10%)

Criteria

4.1. The facility identifies significant hazards to guide management in the allocation of institutionally managed ES&H resources. (Weight = 8%)

Performance Measures

4.1.a. RISK ASSESSMENTS: The facility will develop a schedule by a date certain for completing hazard assessments of ongoing operations, possibly using a graded approach. This schedule will be agreed to by DOE and will include all interim actions that need to be taken as compensatory measures pending completion of comprehensive risk assessments.

Criteria

4.2. The facility will ensure that the authorization basis regarding the safe operations of facilities is maintained. (Weight = 2%)

Performance Measures

4.2.a. OPERATING PARAMETERS: The facility will have a process in place to identify operating parameters and a management system to monitor those parameters to ensure that they are not violated.

PERFORMANCE OBJECTIVE 5: PUBLIC PARTICIPATION

The facility will establish an open and honest public participation program to earn public trust, develop credibility, and ensure public involvement in its decision-making process through open communications and participation in state, national, and international activities. (Weight = 5%)

Criteria

5.1. The facility will have an integrated program to involve the public in ES&H issues. (Weight = 5%)

Performance Measures

5.l.a. PUBLIC PARTICIPATION POLICY: The facility will assess public interests and concerns in the area of ES&H and will develop a public policy statement by a certain date.

5.l.b. PUBLIC PARTICIPATION POLICY IMPLEMENTATION: The facility will establish an integrated site-specific public outreach program by a date certain. It will include a number of public outreach activities, including public access to site ES&H information.

Appendix L

Contractor Evaluation and Selection Criteria

The Department of Energy needs to encourage contractors with proven experience and approaches that may not appear directly related to the management and operation of DOE facilities to participate in the contracting process. To achieve this objective, the solicitation evaluation and selection criteria must strongly emphasize the importance of innovative and entrepreneurial management approaches and attract the corporation's top managers. Examples of the types of factors that should be considered under these evaluation and selection criteria are:

- Managing changing organizations in a dynamic environment.
- Creating new forms of industrial organizations.
- Creating successful collaborative technology transfer partnerships.
- Diversifying efforts in developing new business lines and entities.
- Creating innovative approaches using new concepts and methods, as well as innovative uses of existing capabilities.
- Having demonstrated experience in developing and implementing environmental, safety, and health programs.
- Managing multinational and diverse organizations.
- Motivating human resources in a downsizing and restructuring organization.
- Increasing over time return on investment for research and development activities.
- Creating and maintaining cohesive relationships with stakeholders and communities.
- Applying alternate incentive methodologies.

In addition, solicitations should require a proposer to submit a management plan that will be incorporated into the awarded contract. This plan will:

- Set forth the conceptual framework for the management strategy to implement the DOE vision for a particular facility/site.
- Detail specific goals to be achieved in the first year, in three years, and in five years.
- Set forth the process the contractor will use to fill in the "planning gap" between goals and the current situation.
- Establish clear "metrics" to facilitate objective measurement of contractor performance and achievements against DOE's contractual expectations.

QUESTIONS FROM CONGRESSMAN DANA ROHRABACHER

Question 5: Finally, on page 2 of your prepared testimony, you state: "Over the next few years, we will compete and/or restructure more than $40 billion worth of contracts in all. On the basis of contract reforms already implemented at some of our facilities--such as Idaho National Engineering Laboratory--we believe significant savings as well as improved effectiveness will result from this initiative."

a. Please provide a listing of those $40 billion worth of contracts, and a time schedule for competing and/or restructuring each.

b. Please provide an estimate of the cost savings achieved to data, as well as the analytical basis for that estimate.

Answer: Currently, we are in the process of setting up a cost saving measurement system to provide substantive data for our FY 1995 contract reform actions and will provide the data once it is available. For the record, we have provided a table listing each contract and the status of each.

U.S Department of Energy

Major Contract Competition Schedule

Contractor	Facility	State	Contract Value	Contract Expiration Date	Comment
Bechtel Petroleum Operations	Naval Petroleum Reserve	CA	$1.6 Billion	31-Jul-95	Two Year Extension
Rockwell International Corp.	Energy Technology Engineering Center	CA	$482 Million	30-Sep-95	On Hold
EG&G Energy Measurements, Inc.	Nevada Test Site	NV	$450 Million	31-Dec-95	Compete
EG&G Rocky Flats, Inc.	Rocky Flats Plant	CO	$3.9 Billion	31-Dec-95	Awarded to Kaiser Hill
Hanford Environmental Health Foundation	Hanford Site	RL	$11 Million	31-Dec-95	On Hold
Raytheon Services Nevada	Nevada Test Site	NV	$729 Million	31-Dec-95	Compete
Reynolds Electrical & Engrg. Co.	Nevada Test Site	NV	$675 Million	31-Dec-95	Compete
Ross Aviation, Inc.	Albuquerque Operations Office	NM	$79 Million	28-Feb-96	Compete
Martin Marietta Energy Systems, Inc.	Oak Ridge National Lab Y-12	TN	$16.6 Billion	31-Mar-96	Two Year Extension
Wackenhut Services, Inc.	Rocky Flats Plant	CO	$101 Million	31-Mar-96	Awarded to Kaiser Hill
Associated Universities Inc.	Brookhaven National Laboratory	NY	$6.7 Billion	30-Sep-96	Five Year Extension
EG&G Mound Technology	Mound Plant	OH	$1.5 Billion	30-Sep-96	Two Year Extension
Lovelace Biomedical & Environmental	Inhalation Toxicology Research Institue	CA	$279 Million	30-Sep-96	On Hold
Mason & Hanger-Silas Mason CO., Inc.	Pantex Plant	TX	$1.2 Billion	30-Sep-96	No Decision
Princeton University	Princeton Plasma Physics Laboratory	NJ	$2.4 Billion	30-Sep-96	No Decision
Southeastern Universities Res. Assoc.	Continuous Electron Beam Accelerator Facility	VA	$592 Million	30-Sep-96	Five Year Extension
Stanford University	Stanford Linear Accelerator Center	CA	$2.8 Billion	30-Sep-96	Five Year Extension
Univ. of Georgia Research Foundation	Savannah River Ecology Laboratory	SC	$119 Million	30-Sep-96	No Decision
University of California	SF-Lab of Radiobio & Env Health	CA	$45 Million	30-Sep-96	No Decision
University of Chicago	Argonne National Laboratory	IL	$8.9 Billion	30-Sep-96	No Decision
Westinghouse Savannah River Company	Savannah River Laboratory and Plant	SC	$13.5 Billion	30-Sep-96	No Decision
Iowa State University	Ames Laboratory	IA	$659 Million	31-Dec-96	No Decision
Universities Research Association, Inc.	Fermi National Accelerator Laboratory	IL	$3.8 Billion	31-Dec-96	No Decision
TOTAL			$40,031 Billion		

Question from Representative Rohrabacher

Question 6: At the top of page 3 of your prepared testimony, you discuss the Yergin Task Force on Strategic Energy Research and Development.

Please provide a copy of (a) the charter for the Yergin Task Force on Strategic Energy Research and Development; (b) a list of the Task Force subcommittees' /working groups' /panels' membership - including the job title, affiliation and address for each; and (c) the Task Force's funding level and the source of that funding.

Answer: (a) The Secretary of Energy Advisory Task Force on Strategic Energy Research and Development, commonly known as the Yergin Task Force, is a subcommittee of the Secretary of Energy Advisory Board (SEAB). The SEAB charter and the Terms of Reference for the Task Force are attached. (Attachments 1 and 2) (b) A list of the membership, including job title, affiliation and address for each is provided as Attachment 3. There are no separate Task Force subcommittees, working groups or panels. (c) The Task Force's funding level is approximately $130,000, using Departmental Administration funds. This funding covers travel expenses of Task Force members in direct support of DOE activities and meeting space. Task Force members provide their services without salary compensation.

DEPARTMENT OF ENERGY

CHARTER

SECRETARY OF ENERGY ADVISORY BOARD

1. Committee's Official Designation:

   Secretary of Energy Advisory Board (SEAB or the Board).

2. Objectives and Scope of Activities and Duties:

   To provide advice, information, and recommendations to the Secretary of Energy on the Department's basic and applied research and development activities, economic and national security policy, educational issues, and on any other activities and operations of the Department of Energy as the Secretary may direct.

3. Time Period Necessary for the Board to Carry Out Its Purpose:

   The Board is expected to be continuing in nature.

4. Official to Whom this Board Reports:

   The Board reports to the Secretary of Energy.

5. Agency Responsible for Providing Necessary Support for this Board:

   Department of Energy (DOE).

6. A Description of Duties for which the Board is Responsible:

   The duties of the Board are solely advisory and are stated in Paragraph 2 above.

7. Estimated Annual Operating Cost in Dollars and Person-Years:

   The estimated annual operating cost of direct support to the Board is $380,000 and requires approximately 4 person-years of full-time staff support.

8. Estimated Number and Frequency of Meetings:

   The Board is expected to meet at least twice each year. Other meetings of the Board may occur as requested by the Secretary. In addition, approximately 20 meetings each year by standing and ad hoc subcommittees are anticipated.

9. Committee's Termination Date (if less than 2-years from the date of establishment or renewal):

   Not applicable.

10. Subcommittees:

    a. To facilitate functioning of the Board, both standing and ad hoc subcommittees may be formed. If appropriate, subcommittees may be independently chartered under the aegis of the Board.

    b. The objectives of the subcommittees are to undertake fact-finding and analysis on specific topics and to provide appropriate information and recommendations to the Board and Secretary with respect to the responsibilities of the Board.

c. The Chair (or co-chairs), in consultation with the Secretary, will appoint members of subcommittees; the Secretary will appoint members to chartered subcommittees. Members from outside the Board may be appointed to any subcommittee to assure the expertise necessary to conduct subcommittee business.

d. Subcommittee chairs will be appointed by the Board Chair (or co-chairs), in consultation with the Secretary of Energy.

e. Except for classified reports, public review and comment on subcommittee reports may be solicited prior to their consideration by the full Board. As part of this process, reviews for accuracy, completeness, and balance may be requested from experts who have not been involved in the preparation of a given report.

11. Members:

a. The membership of the SEAB will include approximately 35 individuals, selected on the basis of their professional experience and competence in quality management, basic sciences, renewable energy, energy policy, environmental science, economics, education, and individuals representing broad societal concerns. Appointments may be made for up to two years. Members may be appointed for additional terms. Membership shall reflect a balance of expertise and viewpoints in these areas. Particular attention will be devoted to obtaining a balanced membership in the areas of interests, points of view, and geography. Board members will be appointed by the Secretary of Energy. The chairs of Board subcommittees, if not already members of the Board, may be appointed as nonvoting ex-officio members of the Board. At the Secretary's discretion, the chairs of other DOE advisory committees may also be appointed as nonvoting ex-officio members of the Board.

b. The day-to-day activities of the Board will be managed by an Executive Director, who shall serve as the "Designated Federal Officer" when the Board meets. The Executive Director shall have specific authority to adjourn any meeting of the Board or its subcommittees that is not considered to be in the public interest. Subcommittee directors, as appointed by the Executive Director, serve as "Designated Federal Officers" for subcommittee meetings.

12. Chairperson:

The Secretary of Energy will appoint the Chair (or co-chairs) and may designate a vice-chair of the Board. The Chair will serve a two-year term, and may be re-appointed for an additional term.

This Charter for the Advisory Committee named above is hereby approved on:

Date: December 30, 1993

Signature on file
Howard H. Raiken
Advisory Committee Management Officer

Date Filed: December 30, 1993

SECRETARY OF ENERGY ADVISORY TASK FORCE ON STRATEGIC ENERGY RESEARCH DEVELOPMENT

TERMS OF REFERENCE

1) The Task Force should examine the existing legislative and policy framework which creates the strategic context for DOE's energy R&D programs, including:

   - o DOE's Strategic Plan: Fueling a Competitive Economy
   - o Title XX of the Energy Policy Act (EPACT): Goals for R&D
   - o White House R&D Policy Principles and Priorities (May 6, 1994)
   - o Guiding Principles, President's Council on Sustainable Development

   From examination of statutory and policy documents such as these, the Task Force should develop a conceptual framework that reflects the goals, policy priorities, technology considerations, and national needs which should shape the Department's strategic energy R&D programs in the future.

2) Within this framework, the Task Force should conduct a careful assessment of DOE's energy R&D programs. This assessment should examine in some depth the expected benefits of the R&D, vis-a-vis the strategic framework, as well as other factors, such as time to maturity, riskiness of the undertaking, adequacy of commercialization plans, integration with industry, and the estimated time and effort to completion. The Task Force should also seek information, for completeness, on selected technologies not supported by DOE.

3) Based on these inputs and its findings, the Task Force should then look more broadly at the overall portfolio and address the larger issues of composition, alignment and balance. This examination should look at whether: key goals are supported; the portfolio is sufficiently diversified; the balance between near- and long-term R&D is appropriate; and significant gaps or duplications exist.

4) During its assessment and deliberations, the Task Force should interact with the National Energy Policy Plan process under development by DOE. The Task Force should also seek broad stakeholder input aimed at receiving an extensive and comprehensive set of perspectives on the status, merit, viability, and commercial prospects of various energy R&D programs.

5) In conjunction with this overall review, the Task Force will examine and provide advice on DOE's research, development, demonstration and commercialization management plan, as required by Title XXIII of EPACT. This plan provides, in part, an inventory and status report on more than 100 technologies.

6) The Task Force will submit a report that is expected to provide an informed basis for developing a comprehensive DOE energy R&D strategy, including an assessment of the current portfolio and specific recommendations for achieving greater portfolio alignment with national needs. It may also recommend mechanisms for improving R&D planning, management and productivity, and processes for enhancing technology deployment to meet the nation's long-term needs for sustainable energy production and use.

SECRETARY OF ENERGY ADVISORY BOARD
TASK FORCE ON STRATEGIC ENERGY RESEARCH & DEVELOPMENT

Dr. Daniel Yergin - Chairman
President
Cambridge Energy Research Associates
Cambridge, Massachusetts

Mr. Michael Baly
President
American Gas Association
Arlington, Virginia

Mr. Larry Bean
Administrator
Department of Natural Resources
State of Iowa
Des Moines, Iowa

Mr. Michael Bonsignore
Chairman and Chief Executive Officer
Honeywell Incorporated
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Vice President for Research and Sponsored Programs
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University Park, Pennsylvania

Mr. Scott Sklar
Executive Vice President
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Mr. Larry Smith
Vice President
Safety, Envionment & Technology
Shell Oil Compnay
Houston, Texas

Mr. Richard Stegemeier
Chairman, CEO and President
Unocal Corporation
Brea, California

Mr. Leonard Wahadlo
Chief Executive Officer
National Power Company
Oakland, California

Mr. Mason Willrich (Vice Chair)
Energy Consultant
Palo Alto, California

Current as of April 6, 1995

Questions from Representative Rohrabacher

Question 7: On page 3 of your prepared testimony, you state: " The Department is committed to saving $1.2 billion in our applied energy programs over five years, as part of the $10.4 billion in savings over five years announced by the President in December 1994."

Please provide the analytical basis for the $1.2 billion figure.

Answer: Over the past two years, it became clear to me that, given economic constraints and the President's commitment to put money back into the pockets of middle class America, that we could realize savings in our energy business. In some instances, long-standing initiatives were nearing an end, and in other cases, industry has progressed to the point that we need to redefine the delivery mechanisms necessary to support those technologies. To help in making these decisions, I commissioned Daniel Yergin to conduct an evaluation of the Department's energy programs. This review will provide an in-depth assessment of our research and development investments as they relate to the status of the energy industry. My expectations are that we will find that we are doing the right thing in most cases. However, I fully expect that we will find that R&D investments in some areas have reached the point of diminishing returns. The results and findings of the Yergin Task Force on Strategic Energy R&D, along with the results of the fusion energy study of the President's

Council of Advisors for Science and Technology, will inform the FY 1997 budget decision-making process, where we will provide details of the $1.2 billion cut.

QUESTIONS FROM MR. ROHRABACHER

Question 8:	On page 3 of your prepared testimony, you also discuss the Advisory Committee on External Regulation. Please provide a copy of (a) the charter for the Advisory Committee on External Regulation; (b) a list of the Advisory Committee's membership - including job title, affiliation and address for each; and (c) the Advisory Committee's funding level and the source of that funding.
Answer:	The charter and membership list of the Advisory Committee on External Regulation of Department of Energy Nuclear Safety are provided for the record. The estimated annual operating cost of direct support to the Committee is $1.0 million dollars and is being funded from within the Environmental Management Program.

DEPARTMENT OF ENERGY

CHARTER

ADVISORY COMMITTEE ON EXTERNAL REGULATION OF DEPARTMENT OF ENERGY NUCLEAR SAFETY

1. Committee's Official Designation:

Advisory Committee on External Regulation of Department of Energy Nuclear Safety (the "Advisory Committee" or "Committee").

2. Objectives and Scope of Activities:

To provide advice, information and recommendations to the Secretary of Energy, the White House Office of Environmental Policy and the Office of Management and Budget, on whether and how new and existing Department of Energy facilities and operations, except those facilities and operations covered under Executive Order 12344 (U.S.C. 7158), might be externally regulated to ensure nuclear safety. The Committee shall conduct an assessment of the technical, regulatory, institutional and resource issues related to the potential establishment of an external regulatory regime for nuclear safety with respect to Department of Energy facilities and operations.

The assessment will begin with (a) an identification of the Department of Energy's nuclear facilities and operations now and projected in the future, and (b) an appraisal of the current nuclear safety oversight structure (no change from current law) in order to have a baseline against which to identify and measure meaningful improvements to nuclear safety, and to understand the implications, cost and otherwise, that would derive from options of change.

The assessment will include an evaluation of the historical separation between commercial and defense nuclear activities; the potential advantages and disadvantages of external safety regulation compared to the existing regulatory framework for environment, safety and health; and the concerns and criticisms that have been expressed about DOE's safety oversight by the Congress, the National Academy of Sciences, the Advisory Committee on Nuclear Facility Safety, the Defense Nuclear Facilities Safety Board, and others. Significant transition issues associated with any new regulatory regime will be identified, including a realistic appraisal of both Federal and non-Federal resource impacts.

The Committee's deliberations may result in a set of regulatory options, rather than a single recommendation, for establishing external regulation of nuclear safety at Department of Energy facilities and operations. In this event, the Committee report shall include a discussion of the advantages and disadvantages for each proposed regulatory option.

3. Description of Committee's Duties:

The duties of the Advisory Committee are solely advisory. They shall be:

a. Conduct the assessment, as set forth in Section 2 of this Charter, and develop a report and recommendations on whether and how the Department of Energy might be externally regulated to ensure nuclear safety.

b. Ensure that full consideration is given to the ongoing and planned Departmental efforts to ensure nuclear safety. The Committee shall conduct its activities so as not to detract from the Department's critical efforts to improve current safety conditions.

c. Ensure meaningful and broad stakeholder participation in the assessment, and in the development of recommendations.

4. Officials to Whom this Committee Reports:

The Advisory Committee shall report to the Secretary of Energy. The Committee's report and recommendations shall be submitted simultaneously to the Secretary of Energy, the White House Office of Environmental Policy and the Office of Management and Budget.

5. Duration and Termination Date:

The Advisory Committee shall terminate thirty (30) days after submission of its report and recommendations to the Secretary of Energy, the White House Office of Environmental Policy and the Office of Management and Budget. The Committee will establish a due date during its initial deliberations. This Charter shall expire two (2) years from the date of its establishment, subject to renewal and extension by the Secretary of Energy.

6. Agency Responsible for Providing Necessary Support:

Direct financial and administrative support for the Committee shall be provided by the Department of Energy. Upon request, each participating Federal agency shall support the Committee by providing pertinent information relative to that agency. Some participating entities will also be asked to provide staff support to the Committee.

7. Estimated Annual Operating Cost:

The estimated annual operating cost of direct support to the Committee is $1.0 million, and requires approximately eight (8) person-years of full-time staff support.

8. Estimated Number and Frequency of Meetings:

The Committee is expected to meet approximately eight (8) times, to be scheduled as the Committee deems necessary to complete its duties.

9. Subcommittees:

To facilitate the functioning of the Committee, subcommittees may be formed. The objective of the subcommittees would be to undertake fact-finding and analysis for the parent committee, with respect to matters which are related to the responsibilities of the parent committee.

The Chairperson, in consultation with the Under Secretary of Energy, will appoint members of subcommittees. Members from outside the Committee may be appointed to any subcommittee to secure the expertise necessary to conduct subcommittee business. Subcommittees shall meet as the Advisory Committee deems appropriate.

10. Members:

Approximately twenty (20) Advisory Committee members shall be appointed by the Secretary of Energy for a term of two years, which may be extended by the Secretary. Membership shall include representatives of the affected Federal entities, appropriate experts, and key non-Federal stakeholders. Membership shall reflect a balance of expertise and viewpoints. Non-Federal Committee members may be compensated in accordance with Federal law.

11. Chairperson:

The Secretary of Energy shall designate a Chairperson from among the members of the Advisory Committee.

This Charter for the Advisory Committee named above is hereby approved on:

Date: JAN 25 1995

Marcia L. Morris
Advisory Committee Management Officer

Date Filed: JAN 25 1995

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QUESTIONS FROM CONGRESSMAN DANA ROHRABACHER

Question 9: On the bottom of page 3 of your prepared testimony, you state: "We knew that the labs and the Department needed reorienting to prepare for the new world order, including the introduction of best business practices."

Please (a) define what you mean by "best business practices" and (b) explain how these "best business practices" differ from the current way of doing business.

Answer: The Department's strategic vision has focused on complex-wide initiatives for the implementation of world class and "best business practices" across the Department's five major business lines. The implementation of these practices will allow our operations to "work better and cost less" through increased competition, performance based contracting, greater financial accountability, improved financial management and cost reduction. For example, in partnership with our M&O contractors we are working to abolish requirements that force contractors to mirror the Federal procurement process and instead promote reliance on best commercial practices for material and service purchasing. Best business practices differ significantly from our current paradigm which relies heavily on a top down or controlling management style. Our objective is to measure results against strategic goals and objectives and to pay attention to the bottom line in partnership with our customers, contractors and stakeholders.

QUESTIONS FROM REPRESENTATIVE ROHRABACHER

Question 10a: On page 4 of your prepared testimony, you state: "Many reports have been issued over the years on the general subject of the National Laboratories. Some have focused intensely on management issues; others have focused principally on the missions of the laboratories. In very few cases, however, have any of these prior studies done as good a job as has the Galvin Task Force in providing a sophisticated treatment both of questions of management and mission. Please provide a list of the prior reports/studies on the general subject of the National Laboratories.

Answer: I will be pleased to provide the information for the record. (The information follows:)

REPORTS ON THE NATIONAL LABORATORIES

Date	Title	Source
12/1/75	Report of the Field and Laboratory Utilization Study Group	United States Energy Research and Development Administration
5/22/78	Report to the Congress: The Multiprogram Laboratories: A National Resource for Nonnuclear Energy Research, Development, and Demonstration	General Accounting Office
5/22/78	The Multiprogram Laboratories: A National Resource for Nonnuclear Energy Research, Development, and Demonstration	General Accounting Office
9/1/82	The Department of Energy Multiprogram Laboratories	United States Department of Energy
5/1/83	Report of the White House Science Council	Federal Laboratory Review Panel
7/1/84	Final Report of the Working Group on Federal Laboratory Personnel Issues	United States Department of the Navy, Naval
Research		Laboratory
11/25/86	The Coordination of Long-Term Energy Research and Development Planning	United States Department of Energy, Office of Inspector General
3/1/87	Energy Management: Problems with Martin Marietta Energy Systems' Affiliate Relationships	General Accounting Office
11/1/90	The Future Strategic Role of the Department of Energy's Multiprogram Research Laboratories	Argonne National Laboratory
12/1/90	Energy Management: DOE Needs to Better Implement Conflict-of-Interest Controls	General Accounting Office
7/1/92	Report to the Secretary on the DOE National Laboratories	Secretary of Energy Advisory Board
9/92	Industry as a Customer of the Federal Laboratories	White House Council on Competitiveness
5/1/93	Defense Conversion Redirecting R&D	Office of Technology Assessment, Congress of the United States
9/1/93	Contributions of DOE Weapons Labs and NIST to Semiconductor Technology	Office of Technology Assessment, Congress of the United States
9/22/93	Department of Energy Laboratories: A New Partnership With Industry?	Congressional Research Service Report for Congress
10/28/93	National Benefits from National Labs: Meeting Tomorrow's National Technology Needs	Center for Strategic and International Studies
2/1/94	Changes & Challenges at the Department of Energy Laboratories	Missions of the Laboratories Priority Team
2/1/94	Making Contracting Work Better and Cost Less. Report of the Contract Reform Team	Department of Energy
3/3/94	DOE's National Laboratories: Adopting New Missions and Managing Effectively Pose Significant Challenges	General Accounting Office

Question 10b: Please identify those "very few cases" of prior reports/studies on the general subject of the National Laboratories that have "done as good a job as has the Galvin Task Force in providing a sophisticated treatment both of questions of management and mission".

Answer: The Energy Research Advisory Board report entitled "The Department of Energy Multiprogram Laboratories" dated September 1, 1982, was viewed as having been a thorough study of both the mission and management of the Department. Several findings contained in this report served as input to the Packard Panel Report in 1983, including the following: use external peer reviewers to perform technical audits of laboratory programs; use the laboratories to carry out core elements of the Department's traditional "national trust" fundamental research missions and contribute toward the education and training of scientists and engineers; strengthen the institutional planning process as a vehicle for new initiatives; modify the roles of the operations offices with respect to the laboratories to focus on contract management and de-emphasize their function as policy and programmatic intermediaries between Headquarters and the laboratories; and allow the laboratories to do more reimbursable work for others (other Federal agencies, state and local governments, universities and industry) by relaxing constraints.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 11: **On page 7 of your prepared testimony, you state: "Our starting point will be to address the 26 most burdensome and inappropriately prescriptive directives that we identified through a cooperative effort with our management and operations contractors. A total of 103 orders have been identified as targets for immediate attention, which captures the 26 burdensome and all related orders."**

Please identify the 26 "most burdensome and inappropriately prescriptive directives."

Answer: The following are the burdensome directives identified:

Environmental, Safety & Health:

1.	5000.3b	Occurrence Reporting & Processing of Operations Information
2.	5400.1	General Environmental Protection Program
3.	5400.5	Radiation Protection for Public & Environment
4.	5480.3	Packaging & Transportation of Hazardous Materials, Substances & Waste
5.	5480.6	Safety of DOE Owned Nuclear Reactors
6.	5480.7a	Fire Protection
7.	5480.11a	Radiation Protection for Occupational Workers
8.	5480.18b	Nuclear Facility Training
9.	5480.19	Conduct of Operations
10.	5480.20a	Personnel Selection, Qualification, Training
11.	5480.23	Nuclear Safety Analysis Reports
12.	5480.24	Nuclear Criticality Safety
13.	5482.1b	Environmental, Safety and Health Appraisal Program
14.	5484.1a	Information Reporting
15.	5700.6c	Quality Assurance *

Nonproliferation and National Security:

16.	5500.1b	Emergency Management Systems
17.	5500.4a	Public Affairs Policy & Planning Requirements for Emergencies
18.	5500.2b	Emergency Categories, Classes & Notification & Reporting Requirements
19.	5500.3a	Planning & Preparedness for Operational Emergencies
20.	5635.1a	Control of Classsified Documents and Information **
21.	5633.3a	Control and Account of Nuclear Materials ***

Field Management:

22.	4320.2a	Capital Assets Management Program
23.	4330.4b	Maintenance Management
~~24.~~	~~4700.1~~	~~Project Management System~~
25.	6430.1a	General Design Criteria

Environmental Management:
26. 5820.A Radioactive Management

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* This Order has been replaced by a Rule in the Code of Federal Regulations: Quality Assurance Requirements, 10CFR PART 830.120

** Revised on July 15, 1994 as DOE 5632.1C Protect and Control of Safeguards and Security Interests

*** Revised on September 9, 1994 as DOE 5633.3B Control and Accounting of Nuclear Materials

QUESTIONS FROM MR. ROHRABACHER

Question 12:	With regard to the Department's plan to institute a "necessary and sufficient" process, on page 8 of your prepared testimony, you state: "Pilot programs at diverse facilities will be established from now through September to demonstrate the validity of the process for determining necessary and sufficient sets of standards. The results of these pilot efforts will be examined, then our expectation is to proceed with widespread implementation." What is the specific schedule for the examination of these pilot efforts and for proceeding with widespread implementation?
Answer:	The final schedule of pilot efforts is still being prepared. The schedule, along with plans to implement it, will be provided to the Committee as soon as it is finalized.

QUESTIONS FROM MR. ROHRABACHER

Question 13: On page 8 of your prepared testimony, you also state: "The policy judgement of the Congress, expressed through the Atomic Energy Act, was to rely on a system of self-regulation by the Atomic Energy Commission, and its successor agencies, rather than to impose risks on the system from external regulation."

Is it the Department's opinion that legislative changes to the Atomic Energy Act will be required to authorize external regulation, and if so, what specific changes are needed?

Answer: External regulation of those environmental, occupational safety and health, and nuclear safety matters that are currently "regulated" by the Department involves a number of serious and complicated issues. We are currently examining these issues, including legislative authorization, and expect to have a plan for transitioning to external regulation by the end of the year.

QUESTIONS FROM MR. ROHRABACHER

Question 14: On page 9 of your prepared testimony, you state: "As appropriate, we intend to establish pilot projects as soon as possible to help facilitate and inform the transition to external regulation."

What criteria are to be used to define what is "appropriate"?

Answer: The transition to external regulation will be complicated since the potential external regulatory bodies may not be currently equipped to address many of the unique facilities operated by the Department. We envision the need to establish pilot projects at diverse facilities to assist potential external regulatory bodies in determining the technical expertise and resource requirements needed to responsibly transition to these new responsibilities.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 15:	On page 9 of your prepared testimony, you also state: "The Department will immediately adopt a plan to reduce the impact on the laboratories of the audits appraisals within its control. Specifically, we are committing to a Pilot Performance-Based Oversight Process for all of the Department's laboratories. To the maximum extent possible, oversight will be conducted on a performance basis--with requirements and oversight criteria clearly understood up front. And we will simplify and consolidate our appraisals wherever it makes sense to do so. Some prescriptive approaches are necessary, however, to comply with statutes." What specific "prescriptive approaches are necessary, however, to comply with statutes"?
Answer:	The Department's approach is to review contractors' cost records and cost controls to assure their completeness, accuracy and compliance with contract requirements. These reviews are necessary to determine that contractors are not reimbursed for costs which are unallowable under their contracts, and assist DOE in the general oversight of contract performance. Because of the expenditure of public funds, all cost reimbursement contracts, including DOE's management and operating contracts, are subject to review and audit by the General Accounting Office, appropriate Inspector General Offices and agencies. Section 254 of the Federal Property and Administrative Services Act of 1949, as amended, authorizes agencies to audit and review contractor records under cost-reimbursement contracts, and visit facilities. Inspection and audit of contractors' accounts and records are addressed in § 970.5204-9 of the Department of Energy Acquisition Regulation. This regulation requires contractors to conduct internal audits and reviews of their accounts, records and transactions. Satisfactory internal reviews

conducted by contractors can reduce the scope of review conducted by the Department.

Through the Department's pilot on performance-based business management oversight processes, many reviews will be eliminated or consolidated to reduce the burdens currently placed on the contractors operating our laboratories. Audits of past expenditures will continue to be conducted independently by GAO and the Inspector General's Office.

QUESTIONS FROM MR. ROHRABACHER

Question 16: On page 10 of your prepared testimony, you state: "A similar pilot project will be done for the internal environmental, safety, and health reviews run by the program offices of the Department. (As distinct from the independent reviews conducted by the Office of the Assistant Secretary for Environment, Safety and Health.) This effort will be championed by the Office of Defense Programs, with a plan to be in place within 90 days."

Why are "internal environmental, safety, and health reviews run by the program offices of the Department" even conducted? Why not rely upon "the independent reviews conducted by the Office of the Assistant Secretary for Environment, Safety and Health"?

Answer: The responsibility for implementing environment, safety and health programs rests with headquarters and field office managers of line programs such an Environmental Management and Defense Programs.

The Office of Environment, Safety and Health is the only source of information about the conduct and adequacy of environment, safety and health that is independent of line programs. Under the Atomic Energy Act, the Department of Energy is self-regulating in the areas of worker protection and nuclear safety. The purpose of the Office of Environment, Safety and Health oversight program is to provide the Secretary and Department of Energy managers with an important tool -- an independent and unbiased view of how well they are doing in managing for environment, safety and health, and safeguards and security.

QUESTIONS FROM REPRESENTATIVE ROHRABACHER

Question 17: On page 10 of your prepared testimony, you also state that "an early estimate of the impact on Lawrence Berkeley Laboratory suggests that one annual multidisciplinary business practices appraisal will replace over a dozen separate appraisals that would have been conducted over the next year."

What are the estimated savings for (a) Lawrence Berkeley Laboratory, and (b) the Department through the implementation of this new appraisal process?

Answer: The Department has estimated savings of $50 million in FY 1996 from the review by the ten major national laboratories. The Galvin Task Force has recently submitted its report. The Department has assessed public comments received and provided our analysis and response to the National Science and Technology Council for inclusion in a combined report to the President on DOE, DOD and NASA laboratories. The Department cannot identify programs or sites until the President has reviewed the National Science and Technology Council recommendations. Proposed appropriations language will enable DOE to move savings to appropriate programs and accounts.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 18: On page 11 of your prepared testimony, you state that "on February 28, 1995, we sent to the Federal Register a Notice of Proposed Rulemaking to modify requirements for the M&O contracts purchasing systems, such that we will eliminate the application of the "federal norm" and replace it with a system that expects the use of best commercial practices."

Please provide a copy of that Notice for the hearing record.

Answer: Federal Register, Volume 60, Number 41, of Thursday, March 2, 1995, pages 11646 through 11648, Department of Energy Publication of Notice of Proposed Rulemaking, Management and Operating Contractor Purchasing, is provided for the record.

(6-89)
EFG (07-90)

ATTACHMENT 1

United States Government — Department of Energy

memorandum

DATE: March 5, 1995

REPLY TO ATTN OF: HR-521.1

SUBJECT: Publication of Notice of Proposed Rulemaking, Management and Operating Contractor Purchasing

TO: Distribution

On March 2, 1995, the Department published a significant Notice of Proposed Rulemaking in the Federal Register titled Management and Operating Contractor Purchasing. The rule will amend the Department of Energy Acquisition Regulation (DEAR) to identify certain purchasing system objectives and standards; eliminate the application of the "Federal norm"; and place greater reliance on commercial practices.

One of the major revisions in the rule is the total elimination of Section 970.7104. We believe it is not necessary to retain this section since many of the requirements comply with provisions of statutues or regulations and are already reflected in contract clauses. We do, however recognize that certain of the requirements are not specifically prescribed in other parts of the DEAR. A working group has been formed to review each subsection of 970.7104 and to identify those requirements which may need to be redesignated in other parts of the DEAR. The final rule will include appropriate cross-references, if necessary.

Your comments are welcome and should be forwarded to James J. Cavanagh, Director, Procurement and Property Review and Evaluation Division. Mr. Cavanagh's phone number is 202-586-8257 and his fax number is 202-586-9356.

Gwendolyn S Cowan

Gwendolyn S. Cowan, Director
Procurement Policy Division
Office of Policy
Office of Procurement and
Assistance Management

Attachment

foreign carrier's primary markets, and the ability and incentives of the foreign carrier to discriminate against unaffiliated U.S. carriers.

In addition, the Notice proposes a specified level of foreign carrier ownership in a U.S. carrier at which the proposed entry standard would apply. The Commission asks whether it is desirable to consider an applicant to be "affiliated" with a foreign carrier for purposes of the new rules when the foreign carrier acquires an ownership interest of a certain minimum level or a controlling interest at any level. The Notice requests comment on whether the minimum level of ownership should be set at greater than ten percent, twenty-five percent, or some other level of the capital stock of the applicant.

The Commission also seeks comment on whether the affiliation standard it adopts should replace the current affiliation standard it uses for purposes of classifying an affiliated U.S. carrier as dominant or nondominant on a particular U.S. international route, based on the market power of its foreign carrier affiliate on the foreign end of the route. In addition, the Commission requests comment on whether certain safeguards applied to dominant carriers should be modified to improve their effectiveness. It additionally asks for comment on other proposed nondiscrimination safeguards, including safeguards that would apply to all U.S. international carriers. The Commission also clarifies the definition of a facilities-based carrier and requests comment on its proposal to codify that definition in this proceeding.

Finally, the Notice asks whether the goals of the proceeding would be served by incorporating the proposed effective market access test as an element of the Section 310(b)(4) public interest analysis applicable to foreign entities seeking to acquire an indirect ownership interest of more than 25 percent in U.S. radio licensees. Thus, the Notice asks whether the Commission's evaluation of the public interest should consider whether the primary markets of the foreign entity offer effective market access to U.S licensees to provide the same type of radio-based services as requested in the United States. The Notice also seeks comment on other public interest factors the Commission should consider.

The Notice seeks public comment on whether these proposals are administratively feasible and whether these approaches or other alternatives will best serve the Commission's goals.

List of Subjects in 47 CFR Part 63

Communications common carriers.

Federal Communications Commission.

William F. Caton,

Acting Secretary.

[FR Doc. 95-5127 Filed 3-1-95; 8:45 am]

BILLING CODE 6712-01-M

DEPARTMENT OF ENERGY

48 CFR Parts 933 and 970

Regulation Identifier Number 1991-AB20 Acquisition Regulation; Department of Energy Management and Operating Contracts

AGENCY: Department of Energy.

ACTION: Notice of proposed rulemaking.

SUMMARY: The Department of Energy (DOE) today issues a Notice of Proposed Rulemaking to amend the Department of Energy Acquisition Regulation (DEAR) to modify requirements for management and operating contractor purchasing systems. DEAR subpart 970.71 will be revised to identify certain purchasing system objectives and standards; eliminate the application of the "Federal norm"; and place greater reliance on commercial practices.

DATES: Written comments on the proposed rulemaking must be received on or before May 1, 1995.

ADDRESSES: Comments on the proposed rulemaking should be addressed to the U.S. Department of Energy, Director, Procurement and Property Review and Evaluation Division (HR-525.1), Attention: James J. Cavanagh, 1000 Independence Avenue SW., Washington, DC 20585.

FOR FURTHER INFORMATION CONTACT: James J. Cavanagh, Director, Procurement and Property Review and Evaluation Division (HR-525.1), U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585; telephone 202-586-8257.

SUPPLEMENTARY INFORMATION:

Table of Contents

I. Background
II. Section-by-Section Analysis
III. Public Comments.
IV. Procedural Requirements
  A. Review Under Executive Order 12866
  B. Review Under the National Environmental Policy Act
  C. Review Under the Paperwork Reduction Act
  D. Review Under the Regulatory Flexibility Act
  E. Review Under Executive Order 12612
  F. Review Under Executive Order 12778
  G. Public Hearing Determination

I. Background

The Government-wide approach to evaluating contractor purchasing systems, as set forth in Federal Acquisition Regulation (FAR) Subpart 44.301, is to "evaluate the efficiency and effectiveness with which the contractor spends Government funds and complies with the Government policy when subcontracting." Most Federal contracts require purchases to be made in accordance with the applicable laws and the terms and conditions of the contract, with minimal references back to acquisition regulations. The policy for the extent of reviews of these purchasing systems is set forth at FAR 44.303.

Unlike other contractors, however, a DOE management and operating contractor historically has been expected to conform its purchasing practices to the "Federal norm." As provided at the DEAR 970.7103, the Federal norm is an "evolving concept", which attempts to balance commercial purchasing practices with Federal procurement principles embodied in law and regulation. The DEAR identifies a number of tenets of Federal policy and practices to which DOE's management and operating contractors must adhere. As a result of the Federal norm, and iterations of related reviews, audits, and protest decisions, management and operating contractor purchasing has, over the years, become increasingly Federal-like, replacing efficient and effective commercial business practices.

In accordance with the objectives of the National Performance Review and the Secretary of Energy's Contract Reform Team Report, the Department intends to revise its expectations for management and operating contractor purchasing systems by eliminating the concept of the "Federal norm." In lieu of the detailed tenets contained in DEAR subpart 970.71, which have resulted in the inefficient layering of non-commercial systems and practices, the Department has identified certain purchasing system objectives and standards which it believes are common to superior purchasing activities, whether they be commercial or public.

In addition, as the Department eliminates the concept of the "Federal norm," the Department intends that any disagreements with management and operating contractor purchasing decision(s) be a matter to be settled between the contractor and potential subcontractor(s). Such disagreements are typically handled in this manner in the commercial sector. The Department expects that its management and operating contractors shall handle any such disagreements in an open, fair, and reasonable manner, and endorses the use of ombudsmen and alternative disputes resolution procedures for that purpose. Accordingly, by this action, the Department proposes to delete DEAR 970.7107 which provides guidelines for the consideration of subcontractor level protests. This is consistent with the General Accounting Office proposed rule published at 60 FR 5871, January 31, 1995. It is the intention of the Department to incorporate the changes made by this proposed rule into existing management and operating contracts as soon as practicable after the effective date of a final rule.

II. Section-by-Section Analysis

1. Section 933.170, Subcontract level protests, is removed.
2. The revision to paragraph (a) of the clause, Contractor Purchasing System, at 970.5204–22 provides guidance for a management and operating contract acquisition system consistent with proposed revisions to section 970.7103.
3. Section 970.7101, General, is revised by removing paragraphs (c) and (d).
4. The revision to section 970.7102(a) removes the parenthetical which contains references which will no longer exist when sections 970.7104 and 970.7108 are removed in their entirety. Section 970.7102(b)(3) is revised to provide that review of individual purchasing actions shall be pursuant to FAR Subpart 44.2. Section 970.7102(b)(4) is revised to provide that periodic appraisals shall be in accordance with established policies in section 970.7103.
5. The revisions to section 970.7103 eliminate the concept of the "Federal norm," and establish contractor purchasing systems objectives, expectations, and standards.
6. Section 970.7104, Conditions of purchasing by management and operating contractors, is removed. The DOE believes it is not necessary to retain this section since many of the requirements comply with provisions of statutes and are already reflected in contract clauses. These requirements will, therefore, continue to be applicable as contractual requirements. Some of the requirements, however, are not specifically prescribed in other parts of the DEAR. The Department will review such requirements prior to finalization of this proposed rule and may redesignate appropriate paragraphs, in the final rule, to other parts of the DEAR, if necessary. If such requirements are identified, the Department will publish a **Federal Register** notice, prior to issuing a final rule, listing the paragraphs being considered for redesignation.
7. Section 970.7106, Procedures for handling mistakes relating to management and operating contractor purchases, is removed.
8. Section 970.7107, Protest of management and operating contractor procurements, is removed.

III. Public Comments

DOE invites interested persons to participate by submitting data, views, or arguments with respect to the DEAR amendments set forth in this rule. Three copies of written comments should be submitted to the address indicated in the "ADDRESSES" section of this rule. All comments received will be available for public inspection during normal work hours. All written comments received by the date indicated in the "DATES" section of this notice will be carefully assessed and fully considered prior to the effective date of these amendments as a final rule. Any information considered to be confidential must be so identified and submitted in writing, one copy only. DOE reserves the right to determine the confidential status of the information and to treat it according to its determination in accordance with 10 CFR 1004.11.

IV. Procedural Requirements

A. Review Under Executive Order 12866

This regulatory action has been determined not to be a "significant regulatory action" under Executive Order 12866, "Regulatory Planning and Review," (58 FR 51735, October 4, 1993).

Accordingly, this action was not subject to review under the Executive Order by the Office of Information and Regulatory Affairs.

B. Review Under the National Environmental Policy Act

Pursuant to the Council on Environmental Quality Regulations (40 CFR 1500–1508), the Department has established guidelines for its compliance with the provisions of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*). Pursuant to appendix A of subpart D of 10 CFR part 1021, National Environmental Policy Act Implementing Procedures (Categorical Exclusion A6), the Department of Energy has determined that this proposed rule is categorically excluded from the need to prepare an environmental impact statement or environmental assessment.

C. Review Under the Paperwork Reduction Act

To the extent that new information collection or recordkeeping requirements are imposed by this rulemaking, they are provided for under Office of Management and Budget paperwork clearance package No. 1910–0300. No new information collection is proposed by this rule.

D. Review Under the Regulatory Flexibility Act

This proposed rule was reviewed under the Regulatory Flexibility Act of 1980, Pub. L. 96–354, which requires preparation of a regulatory flexibility analysis for any rule which is likely to have significant economic impact on a substantial number of small entities. This proposed rule will have no impact on interest rates, tax policies or liabilities, the cost of goods or services, or other direct economic factors. It will also not have any indirect economic consequences, such as changed construction rates. DOE certifies that this rule will not have a significant economic impact on a substantial number of small entities and, therefore, no regulatory flexibility analysis has been prepared.

E. Review Under Executive Order 12612

Executive Order 12612 entitled "Federalism," 52 FR 41685 (October 30, 1987), requires that regulations, rules, legislation, and any other policy actions be reviewed for any substantial direct effects on States, on the relationship between the Federal Government and the States, or in the distribution of power and responsibilities among various levels of Government. If there are sufficient substantial direct effects, then the Executive Order requires preparation of a federalism assessment to be used in all decisions involved in promulgating and implementing a policy action. The Department of Energy has determined that this proposed rule will not have a substantial direct effect on the institutional interests or traditional functions of States.

F. Review Under Executive Order 12778

Section 2 of Executive Order 12778 instructs each agency to adhere to certain requirements in promulgating new regulations and reviewing existing regulations. These requirements, set forth in sections 2(a) and (b)(2), include eliminating drafting errors and needless ambiguity, drafting the regulations to minimize litigation, providing clear and certain legal standards for affected legal conduct, and promoting simplification and burden reduction. Agencies are also instructed to make every reasonable effort to ensure that the regulation: specifies clearly any preemptive effect, effect on existing Federal law or regulation, and retroactive effect; describes any administrative proceedings to be available prior to judicial review and any provisions for the exhaustion of such administrative proceedings; and defines key terms. DOE certifies that this rule meets the requirements of sections 2(a) and 2(b) of Executive Order 12778.

G. Public Hearing Determination

DOE has concluded that this proposed rule does not involve any significant issues of law or fact. Therefore, consistent with 5 U.S.C. 553, DOE has not scheduled a public hearing.

List of Subjects in 48 CFR Parts 933 and 970

Government procurement.

Issued in Washington, D.C. on February 24, 1995.

Richard H. Hopf,

Deputy Assistant Secretary for Procurement and Assistance Management.

For the reasons set forth in the preamble, chapter 9 of title 48 of the Code of Federal Regulations is proposed to be amended as set forth below.

PART 933—PROTESTS, DISPUTES, AND APPEALS

1. The authority citation for part 933 continues to read as follows:

Authority: 42 U.S.C. 7254; 40 U.S.C. 486(c)

933.170 [Removed]

2. Section 933.170 is removed.

PART 970—DOE MANAGEMENT AND OPERATING CONTRACTS

3. The authority citation for part 970 continues to read as follows:

Authority: Sec. 161 of the Atomic Energy Act of 1954 (42 U.S.C. 2201), sec. 644 of the Department of Energy Organization Act, Pub. L. 95–91 (42 U.S.C. 7254), sec. 201 of the Federal Civilian Employee and Contractor Travel Expenses Act of 1985 (41 U.S.C. 420) and sec. 1534 of the Department of Defense Authorization Act, 1986, Pub. L. 99–145 (42 U.S.C. 7256a), as amended.

4. At 970.5204–22, revise paragraph (a) of the clause to read as follows:

970.5204–22 Contractor purchasing system.

(a) The contractor shall develop, implement, and maintain formal policies, practices and procedures to be used in the award of subcontracts consistent with DEAR 970.71. The contractor's purchasing system and methods shall be fully documented, consistently applied, and acceptable to DOE in accordance with DEAR 970.7102. The contractor's purchasing performance will be evaluated against agreed-upon criteria in accordance with the performance criteria and measures clause(s) set forth elsewhere in this contract. DOE reserves the right at any time to require that the contractor submit for approval any or all purchases under this contract. The Contractor shall not purchase any item or service the purchase of which is expressly prohibited by the written direction of DOE and shall use such special and directed sources as may be expressly required by the DOE contracting officer.

* * * * *

970.7101 [Amended]

5. Section 970.7101 is amended by removing paragraphs (c) and (d).

970.7102 [Amended]

6. Section 970.7102 is amended at: paragraph (a) to remove the parenthetical at the end of the paragraph; paragraph (b)(3) by removing the words "to assure that management and operating contractors implement DOE policies and requirements as defined in this subpart, in accordance with the contractor's accepted system and methods" and adding in its place the words "pursuant to FAR 44.2"; and paragraph (b)(4) by removing "Subpart 944.3 and 970.7108" and adding in its place "970.7103."

970.7103 [Revised]

7. Section 970.7103 is revised to read as follows: 970.7103 Contractor purchasing system.

The following shall apply to the purchasing systems of management and operating contractors:

(a) The objective of a management and operating contractor's purchasing system is to deliver to its customers on a timely basis those best value products and services necessary to accomplish the purposes of the Government's contract. To achieve this objective, contractors are expected to use their experience, expertise and initiative consistent with this subpart.

(b) The purchasing systems and methods used by management and operating contractors shall be well-defined, consistently applied, and shall follow purchasing practices appropriate for the requirement and dollar value of the purchase. It is anticipated that purchasing practices and procedures will vary among contractors and according to the type and kinds of purchases to be made.

(c) Contractor purchases are not Federal procurements, and are not directly subject to the Federal Acquisition Regulation. Nonetheless, certain Federal laws, Executive Orders, and regulations may affect contractor purchasing, as required by statute, regulation, or contract terms and conditions.

(d) Contractor purchasing systems shall identify and apply the best in commercial purchasing practices and procedures (although nothing precludes the adoption of Federal procurement practices and procedures) to achieve system objectives. Where specific requirements do not otherwise apply, the contractor purchasing system shall provide for appropriate measures to ensure:

(1) Acquisition of quality products and services at fair and reasonable prices;

(2) Use of capable and reliable subcontractors who either:

(i) Have track records of successful past performance, or

(ii) Can demonstrate a current superior ability to perform;

(3) Minimization of acquisition lead-time and administrative costs of purchasing;

(4) Use of effective competitive techniques;

(5) Reduction of performance risks associated with subcontractors, and facilitation of quality relationships which can include techniques such as partnering agreements, ombudsmen, and alternative disputes procedures.

(6) Use of self-assessment and benchmarking techniques to support continuous improvement in purchasing;

(7) Maintenance of the highest professional and ethical standards; and

(8) Maintenance of file documentation appropriate to the value of the purchase and which is adequate to establish the propriety of the transaction and the price paid.

970.7104 through 970.7104–47, 970.7106, 970.7107 [Removed]

8. Sections 970.7104 through 970.7104–47 970.7106, and 970.7107 are removed.

[FR Doc. 95–5173 Filed 3–1–95. 8:45 am]

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QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 19: On page 11 of your prepared testimony, you also state: "The Department has identified certain purchasing system objectives and standards which it believes are common to world-class industrial purchasing activities, and will be assessing our M&O contractors' performance against those goals and standards."

Please define those "purchasing system objectives and standards."

Answer: Under the proposed revision to Section 970.7103 of the Department of Energy Acquisition Regulations, which applies to the purchasing systems of management and operating contractors, the Department has established the following:

(a) The objective of a management and operating contractor's purchasing system is to deliver to its customers on a timely basis those best value products and services necessary to accomplish the purposes of the Government's contract;

(b) The purchasing systems and methods used by management and operating contractors shall be well-defined, consistently applied, and shall follow purchasing practices appropriate for the requirement and dollar value of the purchase;

(c) Even though contractor purchases are not Federal procurements, and are not directly subject to the Federal Acquisition Regulation, certain Federal laws, Executive Orders, and regulations may affect contractor purchasing, as required by statute, regulation, or contract terms and conditions;

(d) Contractor purchasing systems shall identify and apply the best in commercial purchasing practices and procedures to achieve system objectives and ensure the:

(1) Acquisition of quality products and services at fair and reasonable prices;

(2) Use of Capable and reliable subcontractors who either:

    (i) Have track records of successful past performance, or

    (ii) Can demonstrate a current superior ability to perform;

(3) Minimization of acquisition leadtime and administrative costs of purchasing;

(4) Use of effective competitive techniques;

(5) Reduction of performance risks associated with subcontractors;

(6) Use of self-assessment and benchmarking techniques to support continuous improvement in purchasing;

(7) Maintenance of the highest professional and ethical standards; and

(8) Maintenance of file documentation appropriate to the value of the purchase and which is adequate to establish the propriety of the transaction and the price paid.

QUESTIONS FROM REPRESENTATIVE ROHRABACHER

Question 20a: On page 12 of your prepared testimony, you state: "We must be extremely careful not to destroy the National Laboratory system in the name of trying to fix it. Given the uncertainties and risks involved, the Department's strategy will be to pursue a two-track approach to the question of governance of the National Laboratories. On one track we will continue to explore options for changes in the framework for governance of the laboratories. Perhaps a model approaching what is discussed in the Galvin Report might emerge and will satisfy its critics. However, on a separate track we will move aggressively to improve the current system--thus striving to reach the same goals as envisioned for the Galvin model. This second track will involve aggressive implementation of our Management Improvement Roadmap (which will address the issues in Appendix B of the Task Force report), combined with establishment of a new, corporate-level board within the Department, and including external advisors, to provide high-level decision-making regarding the current and future operations and missions of the National Laboratories. Please provide (a) examples of "options for changes in the framework for governance of the laboratories" that the Department will continue to explore.

Answer: The size of the Laboratory Operations Board will be about 16 people, with an equal number of internal and external members. The Under Secretary will chair the Board. Major policy recommendations would be provided to the Secretary. The Board will meet approximately quarterly, and on an as needed basis. The Laboratory Operations Board, will deal primarily with major strategic issues. For example, the Board will provide the framework for developing refined mission allocations to the labs. A Strategic Laboratory Mission Plan will be completed within eight months. The Board will also work with the laboratories to identify and implement means of further integrating the National labs into a system. A copy of the Board's charter is attached for your information.

DEPARTMENT OF ENERGY LABORATORY OPERATIONS BOARD
Charter

PURPOSE

The purpose of the Laboratory Operations Board is to provide advice regarding the strategic direction for the Department's laboratories, the coordination of budget and policy issues affecting laboratory operations, and effective management of the laboratories. The Board's fundamental goal is to help facilitate productive and cost-effective utilization of the Department's laboratory system. The Board will assist the Department in bringing sharpened focus to the mission of the laboratories and ensuring speedy resolution of issues and problems across the integrated laboratory system. The Board will facilitate application of best business practices in management of the laboratories, including reduction of unnecessary and counterproductive management burdens on the labs, and will develop recommendations for the Secretary regarding changes in the size, missions, and scope of laboratory activities in light of changes in federal policy and funding.

MEMBERSHIP

The Board will consist of 16 members. Eight shall be federal representatives selected by the Secretary from among the senior management of the Department. The internal members will be those who have considerable impact on the operations of the laboratories through R&D, policy, and administrative actions. Eight Board members shall be external representatives, selected for their experiences and accomplishments in academia, industry, or government. The external members shall have staggered, six-year terms to provide continuity through changes of Presidential administrations. The external members shall be constituted as a standing panel of the Secretary of Energy Advisory Board. The Laboratory Operations Board shall be chaired by the Under Secretary, with a co-chair selected by the Secretary from among the external members.

ROLES/RESPONSIBILITIES

Each member of the Board will be responsible for providing individual advice and recommendations with regard to:

- Strategic direction for the laboratories, including validation of strategic plans, cross-cutting programmatic and management issues, and coordination of the laboratories as a system;
- Development and implementation of a mission statement for the entire Laboratory system and more tightly focussed missions and programmatic thrusts for each of the laboratories. These statements of mission and programmatic thrust will help serve as the framework for "rightsizing" efforts that would ensure that the laboratories are scaled in accordance to their programmatic strengths and mission activities;
- Management improvement initiatives aimed at eliminating micro-management, reducing the burden of oversight, clarifying lines of control and accountability, and securing higher levels of R&D performance at lower cost;
- Cost-containment, including ensuring application of best business practices and addressing resource impacts of administrative and regulatory requirements;
- Efforts by the Department to enhance integration among its basic and applied research programs, and between the laboratory system and other R&D performers in academia, industry, and other government agencies.

ADDITIONAL ROLES/RESPONSIBILITIES OF EXTERNAL MEMBERS OF BOARD

Each member of the Standing Panel of External Board Members:

o Will be called upon by the Under Secretary to review and provide comments relating to the Department's budget for programs performed within the DOE laboratory system;

In addition, the Standing Panel acting as a group:

o Will conduct analyses of issues affecting the DOE laboratories. Such studies will be conducted under the auspices of the Secretary of Energy Advisory Board and provide the basis for independent views by the Standing Panel;

o Shall provide at least semi-annual letter reports to the Secretary, through the Secretary of Energy Advisory Board. Such reports should assess progress by the Department and the Laboratories in meeting goals in areas such as management initiatives, productivity improvement, mission focus, and programmatic accomplishments.

MEMBERSHIP

The Board is comprised of the following members:

Internal Members
Under Secretary
Chief Financial Officer
Assistant Secretary for Environment, Safety and Health
Assistant Secretary for Defense Programs
Assistant Secretary for Environmental Management
Director, Office of Energy Research
Assistant Secretary for Energy Efficiency and Renewable Energy or
    Assistant Secretary for Fossil Energy (Rotating Basis)
Deputy Under Secretary for Technology Partnerships

External Members
Eight Members from industry and universities, appointed to rotating six-year terms.

Ex-Officio members:
Secretary
Assistant Secretary for Policy, Planning and Program Evaluation
Assistant Secretary for Energy Efficiency and Renewable Energy or
    Assistant Secretary for Fossil Energy (Alternate to Rotating Position on Board)
General Counsel
Two Lab Directors (Rotating Basis)
Field Office Manager (Rotating Basis)

SUBCOMMITTEES

Subcommittees shall be established appropriate to address specific issues, and will include:

Laboratory Directors' Subcommittee
Directors of the DOE Laboratories shall serve on a Subcommittee, which shall meet semi-annually with the Board. This subcommittee shall be authorized to propose agenda items for consideration by the Laboratory Operations Board. This agenda-forcing role is intended to facilitate resolution of programmatic and policy issues facing the laboratories.

Programmatic Deputies Subcommittee
Senior career officials of the Department, from the offices of the internal Board Members, shall serve on a Subcommittee which shall assist in implementation of Board activities and provide senior Departmental representation on the Board during periods of transition of Secretarial Officers and Administrations.

Management and R&D Efficiency Subcommittee
Chaired by the Deputy Under Secretary for Technology Partnerships, this subcommittee shall examine opportunities for achieving cost-savings and management efficiencies, and securing broad application of best business practices across the laboratory system.

ADMINISTRATIVE SUPPORT TO THE BOARD

The Executive Director of the Secretary of Energy Advisory Board and the Director of Energy Research shall provide integrated staffing support to the Board. Duties shall include agenda and meeting preparation, development of issue and background paper, and follow-up actions.

Question 20b: Please provide identification of who specifically is responsible for exploring these options.

Answer: Under Secretary Charles Curtis is responsible, within the Department, for evaluating these options. He is working with the National Science and Technology Council in this effort.

Question 20c: Please provide the schedule for completing this exploration

Answer: We hope to announce the composition and functions of the Laboratory Operating Board in May, 1995.

Question 21: At the bottom of page 12 and top of page 13 of your prepared testimony, you state: "By March 31, 1995, the Department will formally charter a Laboratory Operating Board, to be chaired by the Under Secretary of Energy. Membership would consist of the senior management officials within the Department that utilize and impact the cost of doing business at the National Laboratories, as well as subgroup of private sector advisors, who will be constituted as a standing panel of the Secretary of Energy Advisory Board."

Please provide: (a) a copy of the charter for the Laboratory Operating; (b) a list of the Laboratory Operating Board's membership (including the subgroup of private sector advisors), including the job title, affiliation and address for each; (c) criteria used in selecting the"subgroup of private sector advisors"; and (d) the Board's funding level and the source of that funding.

Answer: A copy of the Board's charter was provided with our response to the previous question. The size of the Laboratory Operations Board will be about 16 people, with an equal number of internal and external members. The Under Secretary will chair the Board. Major policy recommendations would be provided to the Secretary. The Board will meet approximately quarterly, and on an as needed basis. The Laboratory Operations Board, will deal primarily with major strategic issues. For example, the Board will provide the framework for developing refined mission allocations to the labs. A Strategic Laboratory Mission Plan will be completed within eight months. The Board will also work with the laboratories to identify and implement means of further integrating the National labs into a system.

We have also developed a list of non-federal candidates who will be asked to serve on the Board. Our objective is to involve outside experts from academia and industry who have strong credentials which are relevant to the complex issues which face management of large R&D

institutions. We will forward to you a list of the board membership as soon as we have received commitments from individuals. The funding level for the Laboratory Operations Board has not yet been established. The travel and per diem expenses for non-federal members, for meetings which would be expected to occur at least quarterly, would be contained in the budget of the Secretary of Energy Advisory Board.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 22. On page 17 of your prepared testimony, you state: "The number of CRADAs has grown to over 1200, which involve commitments from our industrial partners of more than $1 billion."

Please provide documentation of the $1 billion industrial commitment figure cited in your testimony.

Answer: During the negotiation phase of a CRADA, the Department of Energy requires that its partners identify the value of their contribution (cash and in-kind researcher costs, facility expenses, etc.) that will be invested through the duration of the CRADA. That information on the valuation is then recorded in the Department's Integrated Technology Transfer System (ITTS) database. This information is aggregated and the "$1 billion" figure is an estimated value to completion for all of the Department's CRADAs. The CRADA as a form of contract, reflects both the Department's and its partner's commitments.

QUESTION FROM REPRESENTATIVE ROHRBACHER

Question 23: On page 17 of your prepared testimony, you also state: "The Galvin Task Force suggests that the Department has now overemphasized industrial competitiveness."

Do you concur with this Galvin Task Force suggestion, and if not, why not?

Answer: I agree with the Galvin Task Force that we had inadvertently fostered a misperception as an outcome of our efforts to drive culture change within the Department. The report also noted that this emphasis was changing within the Department. I do not believe that the Department is currently overemphasizing industrial competitiveness. To the extent that the Department has placed a high emphasis on industrial competitiveness, I think this emphasis was appropriate because it drove institutional changes at the Department that would not have been made otherwise. Our challenge now, as before, is to ensure that the changes that we have been making -- including improved management of our partnerships, enhanced leveraging of R&D dollars, and removal of bureaucracy -- are built upon in a way that ensures that the Department's missions drive our partnerships and that competitiveness benefits are a derivative of our mission work. In short, benefits to competitiveness are the result, the by-product of our mission activities, not an alternative to them. The Department, for example, has issued criteria that will be used whenever the Department enters into technology partnerships that involve joint investment of funds and/or capabilities by all parties. Those criteria derive from lessons we learned during the past several years as a result of the partnership activities that we have been emphasizing at the Department.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 24 (a): **On page 1 of the Attachment to your prepared testimony entitled "GALVIN REPORT RECOMMENDATIONS: DOE POSITION, COMMITMENTS, AND DEADLINES" (hereafter referred to as the Attachment), it is stated that "[t]he Phase 1 upgrade program to the LANSCE will be completed by July 1995."**

Please explain the specifics of the "Phase 1 upgrade program to the LANSCE", including cost.

Answer: The Phase I LANSCE upgrade project is scheduled for completion in July 1995, and will cost $15 million (FY 1994 DoD funds). The main technical objectives are:

- improved beam availability to LANSCE users - greater than 80 percent (with respect to schedule) by 1996,
- less than 10 percent downtime from intervals greater than 8 hours by 1996,
- improved capability for routine and sustained operation of LANSCE (i.e., 8 months per year by end of Phase II),
- personnel access to experimental area in the neutron scattering center with proton storage ring beam on,
- reduced beam delivery operating costs, and
- reduced radiation exposure.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 24 (b): **On page 1 of the Attachment to your prepared testimony entitled "GALVIN REPORT RECOMMENDATIONS: DOE POSITION, COMMITMENTS, AND DEADLINES" (hereafter referred to as the Attachment), it is stated that "[t]he Phase 1 upgrade program to the LANSCE will be completed by July 1995."**

The use of the term "Phase 1 upgrade" implies that there are additional upgrades being contemplated. Please elaborate on potential additional LANSCE upgrades, and their projected costs.

Answer: The Phase II LANSCE upgrade project is scheduled for completion in FY 1996, and will cost $20 million (FY 1995 DoD funds). Phase II, which completes the LANSCE upgrade, is aimed at additional longer-term measures to improve beam availability and increase performance of the neutron source. The main technical objectives are:

- beam availability greater than 85 percent by 1997,
- less than 5 percent downtime from intervals greater than 8 hours by 1997,
- access to experimental area in the neutron scattering center with weapons neutron research beam on,
- additional capability for more neutron-beam lines and neutron-scattering instruments, and
- 100 micro-amps routine operating current at 20 Hertz by 1997

Question 25. On page 5 of the Attachment, it is stated that "the Department has developed or is working on technology roadmaps for the forest product, refining, steel, glass, chemical, metal casting, and aluminum industries--which collectively account for more than 80 percent of the nation's manufacturing energy use and together generate approximately 90 percent of U.S. manufacturing waste."

Please provide a copy of each of the technology roadmaps that have been developed to date.

Answer: None of the technology roadmaps for the seven industries have been completed to date. It is expected that the roadmaps for the glass, forest products steel, and metalcasting industries will be completed in the fourth quarter of fiscal year 1995 and that the remaining roadmaps will be completed no later than the third quarter of fiscal year 1996. The roadmaps are derived from the list of industry identified research priorities and follow the development of the vision statement. These roadmaps will identify the critical research needed for each industry to achieve the targets expressed in their vision statements. Presently vision statements and research agendas are being developed by the glass, chemical, metal casting, and aluminum industries. The steel industry will announce its vision and research agenda on May 2. The forest products industry has completed its vision statement and research agenda and plans to complete the supporting technology roadmaps by this fall. Attached is Agenda 2020, the Forest and Paper vision and research agenda.

Agenda 2020

A Technology Vision and Research Agenda for America's Forest, Wood and Paper Industry

November 1994

Background

This Technology Vision and Research Agenda was developed by the Chief Technical Officers of the forest, wood, pulp and paper industry, with advice from research institutions and other organizations. Guidance was provided by the industry leadership through a committee of Chief Executive Officers.

The Association Board of Directors, at their meeting on October 14, 1994, approved this document and authorized the work needed to develop an implementation plan for the Research Agenda in collaboration with agencies of the federal government and the major institutions with expertise in the field.

Issued: November, 1994

TABLE OF CONTENTS

Page

Glossary of Acronyms ... 1

Executive Summary ... 2

1. Introduction ... 6

2. Background ... 7

3. The Forest, Wood and Paper Industry Today ... 7
   A. Industry Overview ... 7
   B. Forestry ... 8
   C. Wood Products ... 8
   D. Pulp and Paper Products ... 9
   E. Global Competitiveness Issues ... 10

4. The Vision for the Future ... 11
   A. Forest, Wood and Paper Industry Overview ... 11
   B. Forest Resources ... 12
   C. Wood Products ... 13
   D. Pulp and Paper ... 13

5. Technology Summary ... 15

6. Research Priorities ... 15
   A. Sustainable Forest Management ... 16
   B. Environmental Performance ... 17
   C. Energy Performance ... 18
   D. Improved Capital Effectiveness ... 18
   E. Recycling ... 19
   F. Sensors and Control ... 20

7. Closing Comments and Next Steps ... 20

Appendices - Acknowledgments ... 21

GLOSSARY OF ACRONYMS

AF&PA	American Forest & Paper Association
DOE	United States Department of Energy
FPS	Forest Products Society
NCASI	National Council for Air & Stream Improvement
R&D	Research and Development
RPTA	Recycled Paperboard Technical Association
TAPPI	Technical Association of the Pulp and Paper Industry

AMERICA'S FOREST, WOOD AND PAPER INDUSTRY

LOOKING TO THE 21ST CENTURY: A TECHNOLOGY VISION AND RESEARCH AGENDA

EXECUTIVE SUMMARY

This document presents the forest, wood and paper industry's perspective of where the industry stands today, a desired state for the industry twenty-five years into the future, and the technology-related issues that must be addressed to accomplish the industry's vision of the future.

In many respects, this document represents a bold step forward for the industry. Never before has the industry with such unanimity taken a look at its future, the need for technological development, and ways to leverage its own capabilities with partnerships involving institutions, suppliers, and government.

Recognizing the inability of humans to accurately predict the future, the focus is on direction and broad, general goals rather than specific endpoints and solutions. Trying to predict the future with specificity always results in a presentation of the authors' biases and preconceived solutions to current problems. This report focuses, instead, on identifying major strengths and weaknesses of the industry and pressures from outside. Flexibility and multiple pathways towards the elements of the vision are believed to be essential, providing ability to adapt to a changing environment and unforeseen events.

Realizing that when we look ahead as far as the year 2020 our vision can hardly be 20/20, we must be prepared to re-evaluate our perspective periodically–perhaps every 3-5 years.

The Importance of the Industry to the Nation

The forest, wood and paper industry is a worldwide leader, globally competitive and an important contributor to the nation's economy. Employing 1.4 million people directly and producing products valued at more than $200 billion per year, it ranks among the nation's top 10 manufacturing industries.

The wide array of products provided by this industry are safe, functional and, in many respects, essential to the everyday needs of citizens, government and other institutions. At home, paper products provide the bases for communications (through books, newspapers, notepaper and artwork), convenience and improved sanitary conditions (through paper towels, facial tissues, and disposables). Specialty papers provide protection to machines and to people through seals, gaskets, and filters. Paper and paperboard packaging materials protect and conserve all manner of products from production through distribution to end use.

After use, wood and paper products can be recovered for recycling, composting or conversion to energy. The industry has long been a leader in recovery and recycling. Paper is among the most intensively recycled materials in our society. Some 40% (or about 36 million tons per year) of all the paper used in the U.S. is currently being recovered for recycling. The industry intends to increase this rate to 50% by the year 2000.

Trees provide the major raw material for this industry, necessitating a commitment to sustainable forestry. Recognizing the importance of this raw material base for long range survival, companies in the industry have a long standing reputation for being stewards of America's forests. Today, the U.S. has far more trees than in the 1920s and grows over one-third more wood than is used and lost to natural causes each year. Among the many favorable attributes of healthy, productive forests are: a favorable impact on the atmospheric carbon dioxide balance, preservation of soils, and protection of animal habitats. Wood also provides a source of clean, renewable energy.

Pressures on Performance and Competitiveness

In spite of the success of the forest, wood and paper industry, it has significant challenges ahead in meeting the changing standards of society while remaining economically viable and globally competitive.

The industry's most valuable asset, an abundant and low cost raw material base, is being challenged by developments both domestically and abroad. Land available for growing commercial wood is diminishing, and pressures are building to remove even more public lands from commercial production. In addition to driving up prices, this puts pressure on the industry to use lower quality wood which can in turn result in higher energy usage. For example, the reduced availability of large timber has shifted wood-based building materials towards engineered products which are more energy and capital intensive.

While recycling reduces the pressures on virgin fiber supply, further increases in recycling will require that lower grades of recovered fiber must be used, or this lower quality fiber must find uses in high quality finished products. Historically, most recycled fiber has been used in less demanding applications. Upgrading low quality recovered material is both costly and energy intensive.

The industry is also being increasingly challenged from abroad. In addition to traditional competitors such as Canada and the Scandinavian countries, which have always placed a high value on forest product exports, challenges are coming from new areas. With government subsidies, low-cost wood and cheap labor, countries such as Chile, Indonesia, Brazil, and South Africa are rapidly becoming the world's low cost producers. Technological leadership, once clearly owned by the U.S. industry, has also been shifted towards Canada and the Scandinavian countries over the past 20-30 years.

More demanding environmental requirements are also a major burden that the U.S. industry must bear over the next decade and beyond. To comply with a wide range of new regulatory initiatives, the industry is facing unprecedented increases in capital expenditures, operating costs and energy use.

The pulp and paper industry is the nation's most capital intensive manufacturing industry and is among the most energy intensive. Currently, the industry is 57% energy self sufficient; up from 36% in 1972–a substantial achievement. However, in spite of tremendous progress, long-term viability demands improvements in energy and capital efficiency if financial performance is to be enhanced and reach satisfactory levels.

The Industry's Vision for the Future – 2020

The U. S. forest, wood and paper industry will continue to be the global leader in providing safe and essential products based on forest resources. The industry must be financially healthy and attractive not only to the investment community but also to the communities in which it operates and the nation as a whole. It will be an example of sustainability with its renewable raw material growing in productive, well-managed forests at rates considerably greater than today. The virgin raw material base will be increasingly leveraged with material recovery and recycling.

Manufacturing plants will operate in harmony with the environment and the communities in which they are located. Water use will be low and discharges to the air and water will be closely controlled to minimize effects on the environment. Regulations will take into account environmental effects as well as energy use and economics.

More energy efficient processes will evolve and an even larger amount of the industry's energy will be self generated based on biomass and waste materials, with excess energy marketed in the form of electricity and liquid fuels.

Productivity will be substantially higher than today, and less costly processes will be developed, improving capital efficiency and leading to enhanced financial performance.

Highly skilled and motivated employees will operate the industry's automated manufacturing facilities. Worldwide technological leadership will be regained as the best scientists and engineers are attracted to the industry and cooperative pre-competitive efforts between the industry, universities, and government flourish.

The Long-Range Research Agenda

Comparing the vision of the future with the current state of the industry leads to a number of research needs. This technology vision and research agenda discusses those needs that will advance the entire industry and are also suitable for cooperative research efforts. High priority efforts will include the areas of:

- Sustainable Forest Management
- Environmental Performance
- Energy Performance
- Improved Capital Effectiveness
- Recycling
- Sensors and Control

Each of these research areas is relevant to all three industry segments–forestry, wood products, and pulp and paper products. This research agenda also covers a spectrum of program maturities, from basic research to development and demonstration projects.

Specific product research and development areas are not addressed in this agenda. Although product development is essential to the long term success of the industry, it is a primary basis for competition among companies and is best left to the individual efforts of company proprietary research and development programs. However, studies of the fundamental chemical and physical characteristics of fibers and fiber structures are included. Individual company researchers and product developers should use the results of this fundamental research to advance proprietary product development and to promote competition.

The Need for a Cooperative Research Program

America's forest, wood and paper industry is facing rapidly accelerating worldwide competition. In addition, complexity is increasing due to changing societal values and interaction of many competing pressures. Many of the research needs facing the industry today are industry-wide and too costly and complex to be handled by individual companies alone. Global competition has forced rationalizing of the industry's long-range, generic research capabilities, making scarce resources too valuable to be wasted with duplication of efforts. Now is the time for the industry to partner with government, suppliers, national laboratories and universities to leverage all available resources. Successful efforts to address the major technological issues discussed in this document will ensure the continued success of one of America's most important basic industries.

Developed by the industry's Chief Technology Officers
under the guidance of a Chief Executive Officers Working
Group for the American Forest & Paper Association

Date: September 26, 1994

AMERICA'S FOREST, WOOD AND PAPER INDUSTRY

LOOKING TO THE 21ST CENTURY: A TECHNOLOGY VISION AND RESEARCH AGENDA

1. INTRODUCTION

The U.S. forest, wood and paper industry represents one of the country's greatest assets. The industry is globally competitive and attractive from the standpoint of sustainability and environmental compatibility. In many ways this industry is an ideal example of a desirable, self-sustaining industry which should be supported by the nation. In addition to generating hundreds of thousands of productive, well-paying jobs and creating wealth shared by many, the industry:

- produces safe, essential products that contribute to improved quality of life and efficiency of government and business;
- is based on a renewable and sustainable raw material;
- produces products which are recycled, composted, converted to energy and are bio-degradable;
- achieves substantial levels of recovery and recycling;
- is based on integrated energy production from residual materials and is a positive contributor to the nation's renewable energy goals;
- contributes favorably to the global carbon balance;
- contributes to forest health through land management, reforestation and conservation of habitats;
- provides sporting opportunities and recreational areas for the public; and
- employs manufacturing processes which use extensive recovery, recycling and pollution prevention methods.

In spite of these desirable characteristics, the industry faces significant challenges ahead in meeting the changing standards of society while remaining economically viable and globally competitive. The industry has and will continue to undergo change over time. Its high capital intensity and the resulting economic consequences of equipment replacement tend to limit experimentation, development and application of large, new core technologies, particularly in the pulp and paper segment. In a rapidly changing environment with increasing social, regulatory and consumer expectations, it is imperative to encourage technological innovation to meet these challenges. At times, these changing expectations exceed the industry's capability to respond and, therefore, require broader collaboration among all stakeholders.

This document provides an overview of the major technology options needed to accomplish the industry's vision. By addressing the needs identified below–through a partnership with government, the industry's stakeholders, public and supporting laboratories and institutions—the continued success of one of America's most essential and desirable industries can be assured.

2. BACKGROUND

The federal government has been investing in the competitiveness of American industry for many years. The forest, wood, and paper industry has participated in this funding to a lesser extent than other industries (notably textiles, automotive, and semi-conductors).

During the past year, the U.S. Department of Energy has been encouraging the industry to develop an industry-supported vision for the future which could be used to better direct government investments in R&D to important industry needs. The DOE is also encouraging the industry to develop a coordinated effort to take advantage of, where appropriate, the $10 billion a year currently being invested by the federal government on industrial research.

The AF&PA, supported by NCASI, RPTA, FPS, and TAPPI, has been identifying the major long-term technological needs and challenges that could have significant impact on the industry 20–30 years in the future. Since perfect vision into the future is impossible, this document should be reviewed and updated regularly, perhaps every 3–5 years. It is hoped that the information assembled here will be useful to: (1) advance the fundamental research needs of the industry; (2) provide a basis for allowing individual companies to become more globally competitive; (3) assist the industry and government funding agencies in allocating research funds to the most important research needs; and (4) serve as a basis for communication with government agencies to expand government/industry partnerships.

The process of developing the industry's technology vision and research agenda has been led by a CEO level working group headed by the Chairman of AF&PA and composed of CEOs representing the full range of industry products and interests. Drawing on earlier work by the AF&PA Energy Council, the CEO group empaneled and guided the efforts of a broad-based Chief Technology Officers' working group to expeditiously refine and finalize an industry research agenda. The input from over thirty institutions supporting industry research was obtained at a workshop held in August (see Appendix). In early September, the CEO leadership group approved the document for discussions with the DOE and for presentation to the AF&PA Board of Directors.

3. THE FOREST, WOOD AND PAPER INDUSTRY TODAY

A. Industry Overview

The American Forest & Paper Association is the national trade association of the forest, pulp, paper, paperboard, and wood products industry. AF&PA represents approximately 425 member companies and related trade associations (whose memberships are in the thousands) which grow, harvest, and process wood and wood fiber; manufacture pulp, paper, and paperboard products from both virgin and recovered fiber; and produce solid wood products. As a single national trade association, AF&PA represents a vital national industry which accounts for over 7% of the U.S. manufacturing output. Its members account for more than 90% of the domestic paper and recycled paper manufacturing capacity.

For more than three centuries, the forest, wood and paper industry has made a vital contribution to the realization of the American dream. The industry has framed houses, finished offices, built containers, packaged goods, spanned rivers, held rails straight, carried news, provided sanitary products; it has provided products for great corporations and small businesses, picnics and political rallies and produced paper for magazines and newspapers, novels and encyclopedias, poetry and art. Generations have been entertained with jigsaw puzzles, paper airplanes, paper dolls and ice cream sticks.

The industry has employed countless millions of working men and women in thousands of mill communities across the nation, bringing growth and vitality to local communities, creating a dependable tax base to build schools and roads and theaters, and public works of every description.

Above all, the forest, wood and paper industry has tried to keep the forest in perspective, not only as an essential basis for industry, but as the handiwork of nature's life cycle, constantly renewing and replenishing itself for the multiple uses of man and wildlife.

Today, the forest, wood and paper industry produces wood and paper products valued at more than $200 billion each year with contributors ranging from large, state-of-the-art mills to small family-owned sawmills and some 7 million individual woodlot owners.

It employs 1.4 million people directly and ranks as one of the top 10 manufacturing industries in 46 out of 50 states.

B. Forestry

A healthy and productive forest is essential for the forest, wood, and paper industry. Today, the U.S. has far more trees than in the 1920s and grows over one-third more wood than is used and lost to natural causes each year.

In 1993, 1.7 billion seedlings were planted in the U.S.; 43% were planted by forest products companies which own only 14% of the U.S. commercial timberlands. An acre of young, healthy, growing trees is capable of producing in excess of 4,000 pounds of wood in one year. These trees consume nearly 6,000 pounds of carbon dioxide during their growth, thereby sequestering carbon for long periods of time.

The industry's future depends on practicing responsible forest management principles for sustainable development to provide for both protection and efficient use of the nation's forests.

C. Wood Products

Wood products occupy a unique position in North American society. Because of its versatility, wood has been used extensively as an industrial material throughout the history and settlement of the continent.

Over 95% of all homes in the U.S. are built with wood-framed walls and roofs. Because wood is a sustainable, energy-efficient building material and is renewable, it is the basis for economic housing. The per capita consumption of wood in the U.S. increased over 30% from 1970 to 1987.

Expanding population and development creates much greater demand for energy conservation. Wood products are preferred over other materials because of low embodied energy and low thermal conductivity. Solid wood is 4 times more efficient as an insulator than cinder block, 6 times more efficient than brick, 15 times more efficient than concrete, and 1,770 times more efficient than aluminum. From raw material to the finished final product, steel studs take 9 times more energy to produce and transport than wood studs; aluminum siding takes 4 times more energy to produce and brick veneer 22 times more energy than wood siding; concrete floors take 21 times more energy to produce than wood floors.

Wood is effective in harsh conditions. Flexible frames "give" during earthquakes, preventing cracking and crumbling. Most of the wood-frame homes survived the 1994 Northridge, California earthquake with little more than cosmetic damage, and wood-frame structures built-to-code also survived Hurricane Andrew's winds.

To meet changing marketplace needs, wood-based products are being combined with other materials to produce advanced material composite products that have optimized characteristics.

D. Pulp and Paper Products

Diversity and change are inherent in the pulp and paper industry. The industry is characterized by both large high speed mills and by many small specialty mills. It is very significant on an international scale. Exports include wood pulp, kraft linerboard, and wastepaper. Major imports include wood pulp, newsprint, and printing and writing paper.

There are many facts and figures that underscore the breadth of the pulp and paper industry in the U.S. The pulp and paper industry includes 547 mills in 42 states, and produces 82 million tons of paper and paperboard and 10 million tons of market pulp. With only 16% of the world's pulp mills, the U.S. produces 35% of the world's pulp. Paper and paperboard are used to publish more than 2 billion books, 350 million magazines, and 24 billion newspapers in the U.S. annually. The U.S. mill output equals that of the next four top countries combined.

From an investment perspective, more than $120,000 of plant and equipment is invested on average for every industry employee, which is more than twice the average of other domestic manufacturing industries. U.S. companies have invested more than $100 billion since 1980 to raise productivity, quality, and underwrite expansion into new products and markets.

America's papermakers are fully committed to their paper recovery goal. A full two years ahead of schedule, the industry has reached its goal of recovery for recycling and reuse of 40% of all paper Americans use (that's 36 million tons) and has set a new goal of 50% recovery by the year 2000. There are about 550 facilities in the U.S. making paper, paperboard and building products. More than 400 of these facilities use recovered paper as a raw material for papermaking. More than 200 rely on it entirely. By the year 2000, expenditures aimed at increasing the industry's paper recycling capacity will have exceeded $17 billion over a twenty-year time period.

The industry has an impressive track record in the environmental and energy fields. It has reduced the amount of water used to produce each ton of paper by 70% over the past two decades and is significantly ahead of schedule meeting emissions reduction goals developed by the EPA. The industry voluntarily reduced dioxin discharges by 92% over the past five years, so that dioxin levels now cannot be measured in the wastewater of every nine out of ten bleached pulp mills, and 100% of mills will have undetectable amounts by 1996.

Industry spending for environmental improvement exceeds $1.0 billion per year, which currently is an estimated 20% of capital spending—a percentage which is anticipated to increase dramatically by the end of this century.

The industry each year consumes approximately 3 quads of energy to make its products and has made significant progress in both energy use and self sufficiency over the last 20 years—currently operating at 57% self sufficiency, up from 36% in 1972. In spite of the above statistics, the industry is still the fourth largest user of fossil fuels in the industrial sector.

E. Global Competitiveness Issues

The U.S. forest, wood and paper industry is currently ranked as one of the most competitive in the world, exporting over $17 billion worth of products in 1993. With the 1993 implementation of the North American Free Trade Agreement (NAFTA) and agreement in the Uruguay Round of multilateral trade negotiations (GATT) to reduce or eliminate tariffs by 2005, long-term prospects for U.S. exports of wood and paper products should improve markedly. However, to realize its full potential, the U.S. industry must remain competitive in raw material supply, compete effectively with the threat of new materials, operate in harmony with the environment, and strengthen its image as a good investment with its stake holders and as a good corporate citizen with the public.

Consider these statistics that reflect both the global competitiveness opportunities and threats to this industry:

- U.S. wood products valued at $7.3 billion were exported in 1993, $2.3 billion of which was softwood and hardwood lumber. Because of tightened lumber supply in the Pacific Northwest and fewer overseas log exports, imports valued at $8.3 billion surpassed exports.
- Exports of U.S. pulp and paper products were also considerable in 1993, totaling $9.6 billion. The relatively strong economic growth in the U.S., coupled with recessions in major industrialized countries, created a surge of paper and paperboard imports into the country. U.S. pulp and paper imports were valued at $10.6 billion.
- The largest wood products export markets for the U.S. in 1993 were Japan ($3.2 billion), European Union ($1.2 billion) and Mexico ($474 million). For pulp, paper and paperboard products, the biggest export markets were Canada ($2.1 billion), European Union ($1.7 billion), and Mexico ($1.4 billion).

Developing countries (e.g., Chile, Indonesia, and South Africa) are now setting the pace as low cost producers of pulp and some paper products; this is due to their low cost of labor and wood, and subsidies from their governments. Other lesser developed countries with abundant wood resources will likely join these challengers. Also Canada and the Scandinavian countries have traditionally been strong competitors in the forest products industry. Because of the high dependence of their national economies on forest products, they will undoubtedly continue to press the U.S. producers with high quality, low cost products, and technological developments.

In the 60's, the U.S. was the clear technical leader in pulp and paper science, processes and equipment manufacture. However, in the 90's the Scandinavian countries and Canada have taken the lead in many areas, presenting a challenge in the next decade to regain the U.S. leadership position.

The tremendous capital investment required during the 1980s to build and maintain the industry's global competitiveness, coupled with increasingly large environmental expenditures, has taken a heavy toll on industry cash flow, and increased debt to historically high levels. The prospect of additional scarce industry capital being invested to meet marginally beneficial but costly environmental requirements further threatens the industry's global competitiveness.

4. THE VISION FOR THE FUTURE

A. Forest, Wood and Paper Industry Overview

The U.S. forest, wood, and paper industry in 2020 will be the clear global leader in providing safe and essential products in harmony with the environment and will be a sustainable contributor to our nation's economy and to the quality of life of its citizens.

Issues related to **sustainability** and to **energy performance** will play a much more prominent role than today. Expanding global population and development will create much greater demands for energy, resulting in heightened recognition of the need for greater **energy conservation**. Raw materials for both durable and non-durable products will be evaluated based on **sustainability analyses**.

Construction materials, increasingly in demand to meet growing world-wide development, will be evaluated and specified for use based on their own energy demands in production and energy conservation performance when in place. Wood-based products will be preferred over other materials because of low embodied energy and wood's renewability as a raw material. The nature of forest resources with respect to watershed stabilization, ground water quality, habitat diversity, soil conservation, and atmospheric carbon dioxide balance help place all products derived from wood in a favored position.

There will be an increased awareness of the total impact of the industry from **sustainable silviculture** to final product disposal. Process changes will continue to be evaluated from a life cycle perspective to ensure an understanding of the total impact of recommended changes. Increasingly, the industry will come to be viewed as fundamentally in harmony with the environment by managing renewable resources to provide useful products, as well as energy, for society. The use of recovered materials not suitable for product use will also be an accepted energy source for conversion in clean waste-to-energy facilities. Recovered materials will be viewed as a resource and effective systems will be in place to minimize material flows to landfills.

Enhanced financial performance nurtured by **improved capital effectiveness** and a broader range of products will make the industry less cyclical and more viable long term. This will allow smaller increments of capacity to be brought on line in response to demand and give the industry more flexibility in installing new technology.

Recycling of wood and paper products will play a much more prominent role as cost-effective collection and processing technologies are developed. Source identification and enhancement, collection, and reuse will heighten the recovery rate, increasing the industry's product content of once lost recyclable fibers and wood residuals. This will result in an increase in the available resource to meet the greater demand for wood products. Under-utilized species will become an important source of raw materials as technology is developed to improve harvesting and produce economical products from them.

B. Forest Resources

By 2020 there will be an increased awareness of the potential for optimizing the substantial forested land assets of the industry as well as strengthened partnerships between industry, government and other private land owners. Recognition for responsible stewardship of public and private lands will have been achieved which integrates the growing, nurturing and harvesting of trees for useful products with the conservation of soil, air and water quality, wildlife and fish habitat and aesthetics. Biomass will be used not only for building materials and paper and paperboard products, but also increasingly for steam, power, and liquid fuel production.

Although trees as a fiber resource are expected to continue to dominate, recycled fiber will be a larger proportion of the raw material supply than today. Residuals from forests, mills, and converting plants as well as non-recyclable recovered paper, and possibly wood grown specifically as fuel, will provide an important renewable fuel resource.

Wood grown as a raw material for the forest products industry is expected to receive major attention over the next several decades. **Genetic technology** and **other forest science advances** (e.g., gene identification and modification) are expected to enable the growing and harvesting of substantially increased quantities of wood from available land resources, potentially more than doubling current yields per acre. With proper research, domestic supplies will be enhanced through a combination of improved genetic selection, bio-engineering, use of marginal agricultural lands for tree production, and forest management. These developments will ensure that the industry remains competitive with other low-cost producing regions of the world.

New technology and practices will have substantially reduced the current impact of **harvesting methods** on forested lands while reducing costs of moving the industry's raw material from the standing tree to its manufacturing facilities.

Based on better understanding of the **properties of wood** and its components and how to use them most efficiently (including an update of the Committee on Renewable Resources for Industrial Materials–CORRIM–report), a plethora of new and improved wood-based products will be developed. While the competition from other technologies such as electronic communications and a possible trend towards lower per capita consumption of forest based products in developed countries may have tended to reduce wood products usage, growth in lesser developed areas and the advantages of renewability and sustainability compared to other materials are expected to increase the total demand for forest, wood, and paper products.

C. Wood Products

Wood products will be valued for their contribution to the nation's livelihood and well-being. Because they are economical and made from a sustainable resource, they will have a favored position relative to products made from non-renewable raw materials. New products and processes for producing them will be strikingly evident compared to the 1990's.

Processing techniques for wood products will be compatible with the range of available resources, including genetically improved strains, and will be used to produce high value products. Log sorting will be done with nondestructive evaluation techniques for optimum use in end products with closely controlled properties. Automated processing systems will have been developed to accurately locate high value material and optimize the yield for structural products. Perhaps most importantly, new wood products, unlike those currently available, will be manufactured to meet a changing marketplace. Building design will emphasize a systems approach, rather than specification of individual building elements. This evolution will favor the flexibility of wood-fiber based products. New products will have high built-in levels of reliability allowing their substitution in uses not presently permitted. Wood-based products will be combined with other materials to produce "advanced material" composite products that have optimized characteristics, taking advantage of the best features of the combined materials. Treatment technologies will increase wood product service life.

The view for the future includes development of high technology processes with highly automated equipment operated by skilled and trained workers in safe and comfortable environments. Education and training of operators, as well as scientists and engineers, will be of increasing importance.

D. Pulp and Paper

Because of their utility, functionality and attractiveness as well as the recognized sustainability of the raw material supply, new and improved pulp and paper products will continue to be widely used in our society. The major virgin raw material for paper will still be wood. Recovered fiber will have a much greater role than it does today–achieving 50% recovery, of which the majority will be used as raw material going into finished products. Alternative plant fiber will be increasingly viewed as a component of fiber supply but will remain small overall.

A refined and improved collection system for recyclable fibers will develop with public education, community, government, and business initiatives and support. This growth of supply will permit the continued increase of recycled content in products of the future and allow for maximum effectiveness of material recovery and solid waste management programs.

Wood pulping will continue to be dominated by chemical processes, but there will be an increasing improvement in the environmental compatibility of pulping and bleaching operations. In accomplishing these changes, a reduction in the capital cost of new pulping facilities and equipment will also have been achieved. The dominant pulping technology is still expected to be the kraft chemical process, but there will be a trend toward increased use of processes that do not utilize reduced sulfur compounds. The chemical recovery of black liquor from the kraft process is anticipated to progress toward

gasification technologies and other processes that have the potential for more optimized cogeneration of the required process electricity and steam. It is also anticipated that these technologies will lower the high capital cost currently associated with the recovery process. The Tomlinson recovery furnace will still be in use, but will be phased out as new facilities come on line and new technologies are introduced. However, advances in design and control will make the Tomlinson units safer and more efficient, and will further improve environmental compatibility. New bleach plants will result in **improved environmental compatibility** through the use of technologies such as reduced water usage, extended use of oxygen based chemicals, and other alternatives. Many of the limitations of mechanical pulping processes (high energy intensity, discoloration with age and reduced strength properties) may be resolved allowing for a greater fraction of paper products to be produced from these high-yield pulps.

It is expected that papermaking processes will also be less capital intensive and will require less energy and fresh water supply. One of the more capital and energy intensive operations in the papermaking process is water removal. Advances are anticipated in the **forming, pressing, and drying** of pulp slurries which will result in improved quality, reduced capital costs, and reduced energy intensity. Paper products will be manufactured to meet ever more stringent consumer quality requirements, and new products will be introduced more quickly to satisfy changing consumer needs. Advanced **process sensors**, computer control systems, expert systems, and mill information systems will continue to be developed and implemented throughout the mill to aid in meeting the product quality requirements as well as to assist in the efficient operation of the manufacturing plant. **Computer-based control systems** will extend into the distribution and logistics networks to reduce inventories and shorten product delivery cycles.

Improved understanding of the **fundamental chemical and physical properties of fibers**, fiber structures and their interaction with other materials applied in or after the papermaking process will assist in designing better products. New products, whether those made from paper alone or in combination with other materials, will be more functional while using less energy and materials.

Energy consumption per unit of product output will be lower; however, electricity will be an increasingly important fraction of the energy used. **Biomass and black liquor gasification** will play an increasingly important role as components of advanced cogeneration technologies. These technologies will be incorporated to optimize the generation of electricity and process heat. Compliance with air regulations will necessitate effective combustion control and accurate continuous monitoring. There will be a trend toward closing the remaining open water cycles in mills and the goal for all mills will be to continue to **reduce water consumption**.

The capital cost of facility rebuilds and expansions as well as new construction will be reduced out of necessity. Technologies involving new processes, **new materials of construction and new construction techniques** will be employed to lower forest, wood, and paper industry capital intensity, bringing it closer to the all-industry average.

With the continual tightening of pulp and papermaking processes will come the need for improved or alternative materials of construction or ways to handle the changing chemistry of the process. To ensure safe operating systems with high levels of integrity, corrosion and materials management must be well understood.

As with the wood products segment of the industry, the future includes the development of high technology processes with highly automated, modern equipment which is operated by skilled and trained workers in safe and comfortable environments. Thus, education and training of operators as well as scientists and engineers will be imperative.

5. TECHNOLOGY SUMMARY

In comparing the forest, wood and paper industry's vision of the future with today's situation, several important strategic issues emerge which drive the proposed technology program to:

- become more competitive with developing countries in wood and fiber production;
- anticipate and understand public expectations associated with its woodlands and manufacturing operations;
- establish a position of increased energy efficiency;
- improve capital effectiveness;
- enable the collection and use of materials generated by non-traditional sources of recovered fiber;
- increase product flexibility and reduce cycle time for new product introduction; and
- maintain leading-edge, low-cost manufacturing facilities for producing high quality products.

6. RESEARCH PRIORITIES

AF&PA, supported by NCASI, RPTA, FPS and TAPPI, has made a concerted effort to develop a long range research agenda for the industry. This effort has involved representatives from the pulp, paper, packaging, recycling, forestry and wood products segments of the industry. It is the intent of this research agenda to set a direction for the entire industry as opposed to any single segment or company. This is consistent with the primary goal of improving the global competitiveness of the industry as a whole. Further, the agenda as presented here, focuses on raw material, environmental, energy and process areas and not on product research areas which are deemed to be more appropriately carried out by individual companies as they see fit. However, the agenda does emphasize an improved understanding of the fundamental science and technology, such that individual company product and process developers can use the anticipated research results to help their company's products not only excel in performance against other materials, but also to maintain healthy intra-industry competition.

Importantly, the implementation of this agenda must be a cooperative effort between government funding agencies that can help accelerate the needed research results and technology commercialization, the research institutions that support the industry, suppliers to the industry, and the industry itself. To this end, the supporting institutions have been involved in the development of this document. Government agencies will find its contents useful in considering policy affecting the industry and in making funding decisions.

The analysis undertaken has led to several high priority areas for research, development, and commercialization. These are summarized below.

A. Sustainable Forest Management

The industry needs to continue its practice of sustainable forestry which integrates the production of wood and paper products with other environmental values including the conservation of soil, air and water quality, wildlife and fish habitat, and aesthetics. On industry's most productive sites, growth rates must increase and fiber quality will need to be substantially enhanced (perhaps 2-4 times current growth rates) to continuously improve the industry's competitive advantage in wood production, harvest and delivery to world markets. Forested areas on marginal agricultural lands will be increased and will need specific attention.

In 1993, AF&PA published a detailed national report outlining the Industry's Suggested Forestry Research Priorities for the 1990's. In addition, the National Research Council of the National Academy of Sciences published a report: *Forestry Research, A Mandate for Change* to serve as a vision for future forestry research.

Common areas of high priority research include:

- *Sustainable Forestry* – Develop systems and methods to sustain the productivity of intensively managed forests for present as well as future generations, including attention to biodiversity.
- *Selection and Hybridization* – Develop optimum natural species and hybrids for use in local conditions.
- *Genetic Engineering and Tree Breeding* – Modification of gene structure and incorporation in improved tree breeding and genetic selection programs to increase growth rates, improve insect and disease resistance, improve fiber quality, and enhance environmental adaptability.
- *Forest Management and Productivity* – Develop and implement management techniques to maximize fiber yields at low cost and to minimize ecological impact, including conservation of certain unique ecosystems.
- *Raw Material Properties* – Given the shift towards a greater reliance on younger, faster grown material, a concentrated effort is needed in the areas of: 1) tree physiology, plant genetics, and the integration of genetics with silviculture to achieve fast-growing, disease-resistant, good form trees that produce high quality wood; and 2) fundamental information that will allow the use of short rotation trees and mixtures of traditional and non-traditional species in a wide range of solid and composite wood products and as a wood pulp raw material.
- *Harvesting* – Develop low-cost and energy-efficient harvesting techniques that have low impact on the productivity of soils and allow for selective cutting.
- *Soils* – Enhance the level of knowledge and develop approaches to protect the basic productivity of soils.
- *Diversity* – Develop methods to ensure adequate preservation of gene pools and local diversity of species.

- *Forest Inventory* – Improve information collection regarding quantity and quality of timber, age class distributions, and the effects of expanding markets on overall supply.
- *Water Quality* – Identify compatible forest practices with other wetland functions, water quality and quantity and beneficial uses of riparian areas.
- *Ecosystem and Landscape Planning* – Develop models and other analytical tools for assessing effects of various landscape patterns and how forestry can help maintain resource values over time and space.

B. Environmental Performance

The industry must continue to assure that manufacturing facilities are worker and community acceptable. Research on understanding the effects of potential discharges should receive priority. Some specific areas for continued and future consideration include:

- *Human and Environmental Effects* – Study effects of manufacturing process discharges on humans and the environment.
- *Energy and Environmental Trade-offs* – Recognize, before broad implementation, the environmental and energy impacts of technology changes directed at improving environmental performance.
- *Improved Wood Products Adhesives* – As new products are developed, the use of adhesives will increase. Research is needed to ensure they are durable, low-cost, and produce no toxic side effects on workers and users.
- *New Treatments for Durability of Wood Products* –The service life of wood in exposed environments can be extended significantly by designs and treatments to control fire, decay, mold, insect infestation, etc. Concerns have been raised with current treatments about the environment, human safety, recyclability and disposability. Research to develop benign treatments that can enhance the durability of wood products and improve dimensional stability is needed.
- *Reduction of the Impacts of Liquid Effluent* – Develop technology for enabling wood products, pulp and paper mills to operate in harmony with the environment.
- *Reduction of the Impacts of Gaseous Discharges* – Develop low odor pulping, efficient capture and treatment of gases, and low emission process technologies for the manufacture of wood, pulp, paper and recycled products.
- *Solid Wastes* – Develop waste minimization, recycling, and energy recovery strategies and technology.
- *Removal of Non-Process Elements in Pulp and Paper Operations* – Develop low cost, energy efficient separation technologies to remove contaminants, and treatment technologies to clean remaining discharges.

C. Energy Performance

To be economically competitive, the industry must be able to utilize the lowest cost fuel at all times and capitalize on emerging low cost technologies. Where economics are favorable, it is possible for many operations within the industry to become essentially independent of fossil fuels, meeting their internal needs with self-generated, renewable fuel from what are now waste streams. In addition, as the nation's demand for electricity and renewable liquid fuels increases, the industry can be an effective partner with utilities, chemical, and oil companies in helping achieve renewable energy goals. To accomplish these goals, energy utilization and production technologies must be improved as well as the development of new techniques to extract maximum energy from the waste streams. A partial list of areas needing attention are:

- *Energy Conservation* – Studies in this area should include methods of low level heat recovery.
- *"Life Cycle Assessment" of Materials and Systems* – Forest, wood and paper products need to be carefully evaluated relative to their energy efficiency in production and use compared to other materials.
- *Energy Efficiency in Wood and Paper Drying* – Wood drying is the largest energy requirement in the production of wood products. Improved understanding of the fundamental relationships between drying efficiency and product quality and uniformity is needed for both wood and paper products.
- *Combined Cycle, Cogeneration* – This area should address the goal of extracting maximum usable energy from biomass, waste and fossil fuels and the development of productive uses for the non-combustible products.
- *Biomass and Black Liquor Gasification* – These technologies should be commercialized to allow improvement in efficiency and reduction of capital intensity.
- *Non-Recycled Wood and Paper to Energy* – Develop collection and conversion technologies to take maximum advantage of the high value wood and fiber components diverting the remaining residuals to energy production in an environmentally acceptable manner.
- *Wood Based Chemicals* – Opportunities for process integration allowing the production of chemicals should be continuously evaluated as new technologies are developed and competing economics change.

D. Improved Capital Effectiveness

Reducing capital requirements per unit of production and sales will enhance financial performance and make the industry more viable by allowing smaller increments of capacity to be brought on-line in response to demand and by giving the industry more flexibility in installing new technology. All R&D areas should address the capital intensity issue as well as their primary objectives.

- *Kraft Chemical Recovery Process* – Develop lower cost, safer and more efficient alternatives to the existing processes. Black liquor gasification has significant potential.

- *Water Removal* – Develop lower cost, more energy efficient forming, pressing and drying technologies for paper and wood products.
- *Construction Methods* – Develop methods for constructing large and small facilities at lower cost.
- *Materials for Fabrication* – Develop new materials for the industry's processing equipment which are cheaper to use, less expensive to maintain, and stand up to the harsh nature of the many chemical process technologies utilized. All through the pulp and papermaking process (e.g., recovery furnaces, bleach plants, paper machines, chemical preparation and storage) better materials are needed to withstand the severe heat, physical, and chemical environments. Also, more rugged and durable materials are needed for the construction of harvesting and log processing equipment, which is subject to extreme mechanical stress.

E. Recycling

Recycling broadens the raw material base of both the wood and paper products industries. Enhanced development of the "urban forests" will continue to be investigated by organizations such as RPTA, who work with equipment manufacturers and the industry to achieve favorable separation and recovery of fibers. Once separated, these fibers can be successfully incorporated in a wide variety of pulp, paper and other products. Optimal combination of the virgin and recycled pulps is highly complex and should receive attention. R&D aimed at lower cost, reducing energy usage and fiber deterioration in recycling is key to significantly expanding the use of recycled products. Some additional specific areas for research, development and commercialization are:

- *Collection Systems* – Innovative collection techniques, systems and equipment are needed to significantly improve the acceptance and economics of moving more recovered materials into products that require increasing performance and quality.
- *Separation Technologies* – New cleaning system technologies are needed to allow for more specific separations between desirable recycled components and unacceptable contaminants, thereby increasing the amount of recycled fiber useable in marketable products.
- *Fundamental Understanding of Fiber-Fiber Bonding* – Improved product strength together with increased recycled fiber use can be achieved by a better under standing of fiber surface chemistry.
- *New Technologies for Sludge Use and Disposal* – Emphasis here should be on methods to allow deinking plants to operate in a more environmentally acceptable and economic manner.
- *Methodologies and Tools* – Techniques are needed to allow the establishment of valid statistical characterization of incoming recycled fiber raw material streams.
- *Concepts and Technologies for Wood Recycling* – Systems for wood recycling need to be developed that are cost efficient and environmentally acceptable. Development of such systems needs to include recycle capabilities for much of the construction and demolition waste currently going to landfills, as well as composite materials containing varying resins and chemical treatments.

F. Sensors and Control

- *Process Measurements and Controls* – The complexity of processes and the need for maximum efficiency and low cost require the need for ever-increasingly sophisticated real-time measurement and control systems. Some specific areas for consideration:
  - *Environmental-related Sensors*, internal and external
  - *Process-related Sensors*
  - *Product Quality Sensors*
  - *Large System Controls* to optimize and control entire mills or larger systems
  - *Expert Systems*
- *Wood, Fiber and Paper Products Characteristics* – Knowing more about the fundamentals of structural, optical and other performance attributes will lead to higher product performance which can either reduce the amount of material needed to obtain necessary performance or allow design of unique qualities into products so they can compete more favorably with other materials.
- *Computer-based Models of Wood Characteristics and Structural Performance* – Development of cost-saving computer-based models are needed that can demonstrate the structural and fire performance characteristics of wood products and systems, enhance innovation in design, reduce costly destructive testing, and provide confirmation of acceptable performance.

7. CLOSING COMMENTS AND NEXT STEPS

The U.S. forest, wood and paper industry has been very successful in maintaining a low cost, high performance position in the global arena over a number of decades. However, it is rapidly being challenged not only by the traditional competitors (Canada, Scandinavia, Japan) but also by some aggressive emerging nations (Brazil, Chile, Indonesia). Other third-world countries with abundant wood resources are expected to enter the global picture within the next 10–12 years. The U.S. forest, wood and paper industry and its stake holders cannot allow this new era of global competition to diminish in any way the industry's future success and growth opportunity. The jobs, exports, infrastructure, assets and opportunity for the creation of wealth that the industry represents must be protected and nurtured. Because of significant demands for capital to meet mandated environmental objectives, industry's research and development investments do not fully address the longer-term needs of the industry. U.S. wood products, pulp and paper companies are currently not spending enough on R&D to remain competitive over the long term against other industries or against European and Scandinavian manufacturers. Thus, the industry welcomes initiatives to strengthen the partnership between government agencies (e.g. the DOE, USDA, Department of Commerce) and industry to ensure that this prominent sector of our economy continues and expands as a viable industry in this country. With early attention to the high priority needs described above, this important industry will continue to maintain its competitive advantage in the global market place.

Following approval of this technology vision and research agenda by the AF&PA Board of Directors, an implementation plan will be developed in partnership with DOE and other interested government agencies, a team of CEO's, Technology Officers, and other appropriate individuals. The plan should include, but not necessarily be limited to:

- an operating structure;
- a framework for partnership; and
- a blueprint for the implementation program and evaluation of results.

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QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 26: **On page 7 of the Attachment, it is stated: "The Department has significantly increased management capability by hiring and training competent project managers, cost estimators and contract coordinators. This new management capability has already resulted in a savings of more than $500 million in the Environmental Management program."**

Please provide the backup analysis that documents this $500 million figure.

Answer: The Environmental Management Program, a pilot program under the Government Performance and Results Act (GPRA), requested and received additional federal positions to increase the oversight of the management and operating contractors implementing the program. The increased authorizations were used primarily to employ technical personnel such as program and project managers, environmental and safety specialists, cost estimators/analysts, and project engineers. The additional capability has allowed the field offices to devote additional hours to overseeing the management and operating contractors, seek innovative ways to do business better, and implement productivity/efficiency programs in several ways. In addition, EM has initiated contract reforms and productivity improvement efforts. These initiatives overlap and it is not always possible to attribute savings to a single discrete initiative. To preclude double counting, we have elected not to tie the savings to any one initiative, but to report savings by process improvement categories. Many of the savings examples span several years and will add to more than $500M.

The following are examples of what has been and could be accomplished by the various field offices at their respective sites.

EXAMPLES OF EM SAVINGS INITIATIVES

New Contracting Strategies (Estimated FY 1995 Pro rata Savings $228.7M)

- The Albuquerque Operations Office incorporated specific cost and accelerated schedule improvement performance specifications and negotiated unit costs into existing contracts at various sites. Estimated savings in FY 1995/1996 is $61M and considerable cost avoidances in outyears. This savings occurred at various sites, but specifically $24M at the Los Alamos National Laboratory, $11M at Sandia National Laboratory, and $3M at Pantex. Specific performance measures were also inserted into the Waste Isolation Pilot Plant resulting in 100% deliverables on time with acceptable quality.

- The Idaho Operations Office awarded a performance-based contract to reduce project management and overhead costs, provide objective performance measures, accelerate technology transfer, and reduce operating costs at the Idaho site. Savings to DOE are expected to be 118$M over the five year contract. Additional initiatives to incentivize contractors to reduce overhead costs are in progress.

- The Oak Ridge Operations Office established an interagency agreement with the US Army Corps of Engineers to dispose of low-level waste in the Formerly Utilized Sites Remedial Action Program (FUSRAP) instead of the previous contractor to achieve lower unit rate. FY 1995 savings are $7.9M with projected cost avoidances projected to be $57M over five years.

- The Idaho Operations Office will use an off-site contractor to transport and treat low-level waste, which has been backlogged since March 1993. FY 1995 savings will be $2.5M in addition to the $1.7M savings realized in FY 1994. This effort has made additional resources available for on-site treatment of mixed wastes.

- The Nevada Operations Office is consolidating M&O contracts into a single performance-based contract to reduce project management and overhead costs. Subcontracts will be used to accomplish specialized tasks and increase accountability. Estimated savings over FY 1995/1996 are $4-5M, with significant cost avoidances over time.

- The Oakland Operations Office is consolidating M&O contracts into a single performance-based contract at the Pacific Northwest Laboratory to reduce project management and overhead costs by 20%, or $300K per year.

- At Richland, the Operations Office has shifted to a performance-based contract from cost reimbursement contract to incentivize productivity, cost efficiency, and innovation. A specific clause was inserted into a current M&O contract to accelerate cleanup activities and make substantial cost reductions. Consolidating M&O contractors is expected to save $4.5M.

Reengineered EM Processes (Estimated FY 1995 Prorata Cost Savings $53.9M)

- The Ohio Field Office will use shaped explosive charges for dismantling steel-framed buildings at Fernald instead of more costly piecemeal methods. A pilot project in the Fall of 1994 provided useful lessons. Negotiations with stakeholders, US Environmental Protection Agency (EPA), and Ohio EPA resulted in acceptance of technique and resultant acceleration of schedule. Estimated cost savings in FY 1995/1996 are $18M.
- The Albuquerque Operations Office adopted mobile treatment for mixed waste that had been initiated through stakeholder meetings and used successfully by the nuclear power industry for several years. Through this approach, mixed waste at the various sites will be treated at the point of generation instead of requiring transport over State roads to a central waste treatment facility. Savings in FY 1996 are estimated to be $12M with considerable out-year cost avoidances. Albuquerque is emphasizing a Waste Minimization/Pollution Prevention program to reduce all waste categories at least 50% from 1992 levels by 1999 with attendant cost avoidances.
- The Oak Ridge Operations Office expedited repackaging mixed-waste sludge drums and saved $7.5M in FY 1995. A process to separate and treat free water co-mixed with sludge will save $11M from FY 1995 through 1999. Oak Ridge also improved operating processes to lower throughput and achieve lower unit costs at the toxic substances incinerator, which is expected to provide cost avoidances of $8M in FY 1996 and $19M in FY 1997.
- The Rocky Flats Field Office reengineered an approach to meet site security requirements which will save $13M over five years.
- The Chicago Operations Office accelerated disposal of the low-level waste schedule through use of interim remedial action under CERCLA requirements. The action was performed under the Corps of Engineers Rapid Response Program at the Ames site. Estimated savings were $2.3M with significant cost avoidances realized in future years.
- The Savannah River Site adopted commercial practices in project management to compress time to plan, design, construct, and start-up projects. Twenty percent greater efficiency and FY 1995/1996 savings of $19M are expected.
- The Ohio Field Office improved data validation practices for laboratory work with estimated FY 1995 savings of $3.8M.

- Richland is introducing changes to cross-cutting processes in order to eliminate non-value added work and to accomplish necessary work more efficiently and effectively. Streamlining engineering practices is expected to save $17M in FY 1995.

Streamlined Assessments (Estimated FY 1995 Pro rata Cost Savings $65.7M)

- The Albuquerque Operations Office is accelerating project closeouts to achieve an estimated cost avoidance of $475M over 15 years. This savings will occur at three sites; $143M at Sandia National Laboratory, $227M at Los Alamos National Laboratory, and $105M at Pantex.
- The Idaho Operations Office has reached agreement with State officials to delay planned expenditures for design and construction costs for a low-risk, low priority waste removal project and still comply with a Consent Order. Expected savings over FY 1995/1996 are $8.4M with significant future cost avoidances. Other low risk activities are being reviewed for elimination or curtailment.
- The Savannah River Site negotiated reduced sampling frequency requirements with State and Federal EPA Agreements that recognizes changing risk and operations characteristics at site. Estimated savings for FY 1995/1996 are $6.7M with no impact on quality of monitoring information.
- The Ohio Field Office adopted use of generic instead of building-specific specifications for dismantling facilities. Off-the-shelf reference reduces design and approval time. Negotiations were held with US EPA and contractors. FY 1995 savings will be $3.8M.
- The Chicago Operations Office initiated an expedited characterization of a facility using a cost effective observational approach instead of using a more data intensive process. FY 1995 savings will be $2M. Results of the characterization will be provided to stakeholders at public meetings.
- The Ohio Field Office accelerated schedule by developing interim records of decision (ROD) while formalizing RI/FS. Negotiations were held with Ohio EPA and US EPA. FY 1995 savings will be $1.8M.
- The Richland Operations Office is streamlining compliance practices to match needs for expected savings of $8M for FY 1995.
- The Ohio/Oak Ridge/Richland/Savannah River Offices are using Streamlined Approach for Environmental Restoration (SAFER) at seven facilities to balance reducing and managing uncertainty with new data collection and contingency planning. Estimated cost

savings of approximately $1.5M per facility could be realized based on FY 1994 pilot project results.

Reduced Project Support Costs (Estimated FY 1995 Prorata Cost Savings $42.1M)

- Richland accelerated a facility shutdown which will save $12M.
- The Rocky Flats Field Office established improved processes in Environment Restoration and other projects to save $17.8M in FY 1995 with anticipated cost avoidance of $62.5M in outyears.
- The Chicago Operations Office converted an existing facility at Argonne East into a waste facility instead of constructing a new plant. Upgrading will result in a cost avoidance of $2.3M in FY 1995, and operating costs are anticipated to remain the same.
- The Idaho Operations Office is pursuing options to demonstrate on a pilot basis that the use of an existing facility (Pit 9 at the site) and proven design and engineering practices to remotely remove and treat low-level waste is feasible for implementation on an expanded scale. Successful demonstration could result in an estimated $100M to $300M avoidance in capital construction costs for each waste treatment facility that will not have to be constructed. CERCLA exempts on-site treatment systems from procedural permit requirements, resulting in considerable cost savings and schedule acceleration. Up-front planning is estimated to save about $6M in Waste Management and Environmental Restoration programs through experience and lessons learned.
- The Chicago Operations Office reduced costs through minimizing waste generation by substituting non-hazardous chemicals in some research activities. An estimated cost reduction of 20% is anticipated.
- The Savannah River Site efforts to minimize waste generation resulted in $4M in capital cost avoidances by extending the operating life of low-level waste storage vaults.

Reduced Overhead (Estimated FY 1995 Prorata Cost Savings $89.7M)

- The Savannah River Site is implementing a security program that recognizes its changing mission that will result in a savings of $57M over five years.
- The Savannah River Site implemented a Flexible Benefits Plan in 1994, which limits physician charges and contains new outpatient surgery payment methodology. Estimated savings in FY 1995 are $43.3M.

- The Rocky Flats Field Office negotiated reduced overtime and insurance compensation in collective bargaining with the union to save $2.7M over five years.

- The Nevada Test Site decreased overhead costs through management de-layering, reduction of unnecessary administrative tasks, and consolidation of safeguards and security activities. FY 1995 savings are $2.7M.

- The Ohio Field Office is using the contractor corporate network license rather than purchasing a separate DOE/OH license. FY 1995 savings will be $645K with cost avoidances realized in following years.

- The Oakland Operations Office consolidated contractual relationships and negotiated reduced frequency of routine reporting with US EPA for CERCLA activities at the Lawrence Livermore National Laboratory. These actions will reduce associated management cost approximately 25% in FY 1995.

- The Richland Operations Office is pursuing initiatives to cut overhead and direct support costs. Actions are being pursued in medical benefit costs, travel, overtime, software development, reduction in security investigations, quality assurance oversight/compliance assurance activities, reduction in commercial leases, reduction in support service contracts, and early retirement. These initiatives are expected to result in cost savings and cost avoidances of $30M.

- At the Albuquerque Operations Office site, $1.3M will be saved in FYs 1995 and 1996 as a result of converting contractor positions to federal positions.

Privatized Activities (Estimated FY 1995 Pro rata Cost Savings $56.5M)

- The Savannah River Site privatized sanitary waste disposal activities. Through use of private off-site facility, capital costs for a new complex construction have been avoided ($34M) and $1.5M in operating costs have been avoided. Other outsourcing initiatives are being evaluated that could result in savings/avoidances of $74M.

- The Oak Ridge Operations Office has used and is seeking private sector expertise to treat liquid low-level waste, mixed wastes, and contaminated soils. Savings in FY 1995 are $300K for a liquid low-level waste project. Avoidance of capital facility construction costs are also projected.

- The Idaho Operations Office changed to a Preferred Provider Organization from a self-insured Dental Plan. Approximately $300K will be saved over FY 1995/1996.

- The Richland Operation Office intends to shift some site services to private sector and local government from the M&O contractor to achieve lower costs, including services such as fire department, laundry, graphics, sewer system, utilities, and low-level mixed thermal treatment. Expected savings in FY 1995 are $20.5M.

Pro rata Cost Savings for FY 1995 from the above examples totals to $536.6M

Note: The Cost Savings in many of the examples above include multi-year savings. Savings for FY 1995 have been determined on a pro rata basis.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 27 (a): On page B of the Attachment, it is stated: "We commit to continued utilization of: (1) an existing Environmental Management Advisory Board (EMAB), ...

(a). Please provide copies of the charter for the EMAB, a list of the EMAB membership - including the job title, affiliation and address of each member of the EMAB as well as any EMAB subcommittees/working groups/panels, and EMAB's funding level and the source of that funding;

Answer: Attached please find the charter for the Environmental Management Advisory Board (EMAB) and a listing of EMAB membership - including the job title, affiliation and address of each member of the EMAB as well as EMAB subcommittees/working groups/panels.

The Board is funded from the general operating budget for the Environmental Management Program as authorized as part of the defense appropriations. The total budget of EMAB for FY 1995 is $1,400,000.00.

Department of Energy
Charter for the Environmental Management Advisory Board

1. **Official Designation:**

   Environmental Management Advisory Board.

2. **Objective, Scope of Activity, and Duties:**

   The Environmental Management Advisory Board will provide the Assistant Secretary for Environmental Management with information, advice, and recommendations on issues confronting the Environmental Management program and on the Programmatic Environmental Impact Statement. The Board will advise the Assistant Secretary from the perspective of affected groups and state and local governments. The Board will be advised of the progress on the Environmental Management projects and the Programmatic Environmental Impact Statement at regular intervals to be determined by the Assistant Secretary.

   The Board will perform the following duties:

   a. Advise the Department of Energy on Environmental Management projects and the Programmatic Environmental Impact Statement;

   b. Issue reports and recommendations;

   c. Recommend options to resolve difficult issues faced in the Environmental Management program, including clean-up criteria and risk assessment, land use, priority setting, management effectiveness, cost-versus-benefit analyses, and strategies for determining the future national configuration of waste management and disposal facilities.

3. Time Period Necessary for the Board To Carry Out Its Purpose:

   Since the task of the Board is to advise agency officials on a series of Environmental Management projects and issues, the time period required to carry out its purpose is continuing in nature.

4. Official to Whom this Board Reports:

   The Board will report to the Assistant Secretary for Environmental Management.

5. Agency Responsible for Providing Necessary Support for the Board:

   United States Department of Energy.

6. Description of Duties for Which the Board is Responsible:

The duties of the Board are solely advisory and are stated in paragraph 2, above.

7. Estimated Annual Operating in Dollars and Person-Years:

The Department of Energy will provide resources sufficient to conduct its business as well as travel and subsistence (per diem) expenses for eligible members. The estimated costs are $1.5 million and approximately 5 Federal permanent staff.

8. Estimated Number and Frequency of Board Meetings:

The Board will meet annually and the Executive Committee will meet approximately quarterly, or as deemed appropriate by the Assistant Secretary for Environmental Management. Specialized subcommittees will meet as deemed appropriate by the Assistant Secretary for Environmental Management.

9. Termination Date (If less than 2 years from the date of establishment or renewal):

Not applicable.

10. Members:

Members of the Board shall be appointed by the Assistant Secretary for Environmental Management for 2 years in order to achieve continuity in membership and make use of the acquired knowledge and experience with Environmental Management projects and the Programmatic Environmental Impact Statement. Members may be reappointed for additional terms of 1 or 2 years.

11. Organization:

The Board will be organized into an Executive Committee and several specialized subcommittees, members of which shall be drawn from the Board.

The Executive Committee, comprised of members selected by the Assistant Secretary, will serve as the focal point for the coordination and presentation to the Board of reviews by the Board's subcommittees.

The Board is authorized to constitute such specialized subcommittees as the Assistant Secretary for Environmental Management and the Board find necessary to carry out the Board's responsibilities. Each subcommittee will be chaired by a member of the Board appointed by the Assistant Secretary. The

Assistant Secretary will review the need for such specialized subcommittees at least once a year to decide which should be continued. Subcommittees will report to the Board through the Executive Committee.

Experts who are not members of the Board may be consulted by the Board, the Executive Committee, or specialized subcommittees, as appropriate.

12. **Chair:**

The Assistant Secretary for Environmental Management appoints a Chair of the Board from the Board membership. The Chair of the Board also serves as Chair of the Executive Committee.

Date: NOV 3 0 1994

J. Anne Whitman
Marcia L. Morris
Advisory Committee Management Officer

Date Filed: NOV 3 0 1994

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QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 27(b): Please provide copies of: (b) the charters/task statements for each of the two ongoing studies by panels of the National Academy of Sciences, as well as a list of the panels' membership--including the job title, affiliation and address for each member of the panels, the panels' funding levels and the source of that funding.

Answer: COMMITTEE TO EVALUATE THE SCIENCE, ENGINEERING, AND HEALTH BASIS OF THE DOE'S ENVIRONMENTAL MANAGEMENT PROGRAM. At the request of the Department (attached), the National Academy of Science has begun a multi-step evaluation of the scientific, engineering, and institutional barriers to achieving a more cost-effective stewardship of the Nation's resources during clean-up of the weapons complex. This examination is far more comprehensive than past analyses, which have involved subject experts in narrow fields.

The Academy is taking a phased approach to conducting this evaluation, based upon the approach used successfully in preparing the report "Building Consensus through Risk Assessment and Risk Management of the Department of Energy's Environmental Remediation Program." The following four forums involving the public and nationally recognized experts are being conducted to encourage educational exchanges among stakeholders, scientists, and decision-makers:

- Evaluation of Regulatory Measures (June 19-20, 1995);
- Setting Priorities, Timing, and Staging (June 26-27, 1995);
- Utilization of Science, Engineering, and Technology in the Environmental Management Program (July 11-12, 1995);

- Integration of Science, Engineering, and Health in the Implementation of the Environmental Management Program (August 29-30, 1995).

These forums are providing the Academy with a wide range of options and observations to be used in the next step of its examination of DOE's clean-up program -- an intense two-week study scheduled to begin late this summer, resulting in an overall set of recommendations to the Department in December.

The study is being performed under an existing cooperative agreement with the National Academy (#DE-AC01-94EW54069), with funding estimated to be up to $612K, coming from the Office of Technology Development and the Office of Integrated Risk Management.

Each of the four forums is led by a sub-committee of recognized experts in the forum topic. Committee members can be contacted through the National Academy of Sciences, attn: Debbie Stine, at 2101 Constitution Avenue NW, Washington, DC.

COMMITTEE TO EVALUATE THE SCIENCE, ENGINEERING, AND HEALTH BASIS OF THE DOE'S ENVIRONMENTAL MANAGEMENT PROGRAM (proposed membership)

Sub-committee on Evaluation of Regulatory Measures

Don Clay (Chair), Don Clay Associates, Inc.
Andrew Caputo, Natural Resources Defense Council

James Curtiss, Winston & Strawn

Marshall Drummond, Eastern Washington University

Daniel Miller, Colorado Department of Law

Bernard Reilly, E.I. du Pont de Nemours & Company

Mary Riveland, Washington State Department of Ecology

Sub-committee on Setting Priorities, Timing, and Staging

Edwin "Toby" Clark, (Chair) Clean Sites, Inc.

Hugh Campbell, E.I. du Pont de Nemours & Company

Mary English, University of Tennessee

Donald "Buzz" Gibson, TRW Environmental Safety Systems

Robert Hazen, New Jersey Department of Environmental Protection

Thomas Leschine, University of Maine

Robert Neill, Environmental Evaluation Group

Lynne Preslo, Earth Tech

Anne Smith, Decision Focus, Inc.

Merv Tano, Council of Energy Resource Tribes

Sub-committee on Utilization of Science, Engineering, and Technology

Frank Parker (Chair), Vanderbilt University

John Ahearne, Sigma Xi

Charles Andrews, S. S. Papadopulos & Associates, Inc.

Edgar Berkey, University of Pittsburgh

Harold Forsen, Bechtel (retired)

Walter Kovalick, Jr., U.S. Environmental Protection Agency

Michael Mastracci, TECHMATICS, Inc.

Phillip Palmer, E.I. du Pont de Nemours & Company

Alfred Schneider, Georgia Institute of Technology

Christine Shoemaker, Cornell University

Herb Ward, Rice University

John Whetton, Whetton Associates

Raymond Wymer, Oak Ridge National Laboratory

Sub-committee on Integration of Science, Engineering, and Health in the Implementation of the Environmental Management Program

Victoria Tschinkel (Chair), Landers & Parsons

Betsy Ancker-Johnson, General Motors (retired)

Philip Brodsky, Monsanto Co.

Davit Chu, Rand Corporation

Benjamin Cosgrove, Boeing Commercial Airplane Group

Brian Costner, Energy Research Foundation

Robert Forney, E. I. du Pont de Nemours & Company

Jim Johnson, Howard University

Mildred McClain. Citizens for Environmental Justice

Bernice McIntyre, Arthur D. Little, Inc,

Maxine Savitz, Allied Signal Aerospace Company

Department of Energy
Washington, DC 20585

JAN 10 1995

Dr. Bruce Alberts
President, National Academy of Sciences
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

Dear Dr. Alberts:

The National Academy of Sciences has a proven track record in providing the Department of Energy with scientific analyses critical to the success of the Environmental Management program. Faced with constrained budgets and the need to develop a system that works better and costs less, the Department once again would be aided by an analysis by the Academy. It is recognized that the cleanup problems now facing the Department and the Nation require a total re-engineering of existing systems and a thorough examination of the scientific, engineering, and institutional barriers to achieving a more cost-effective stewardship of the Nation's resources. This examination should be far more comprehensive than past analyses, which have involved subject experts in narrow fields.

Given the enormity of the Environmental Management Program, it is envisioned that a comprehensive evaluation will be more successful if it is focused around a few broad areas of major concern. Suggested topics include priority setting, timing and staging of activities, technology development, management and organizational systems, and regulatory measures.

Discussion on these and other issues would start with a series of public fora, which would then lead to an intense summer study. The public fora would provide options and observations for the summer study, while allowing for educational exchanges between stakeholders, scientists, and decision makers. The summer study, attended by nationally recognized experts, would help frame options and factors for decision making. I would like to see the results of the study by December 1, 1995.

I have asked Admiral Richard Guimond and Dr. Carol Henry to be the principal Department points of contact for framing the specific questions and the context in which the Academy reviewers would perform their analysis. This work will be performed under cooperative agreement #DE-AC01-94EW54069. I look forward to working with the Academy to obtain the scientific and engineering community's views on these very important issues.

Sincerely,

Thomas P. Grumbly
Assistant Secretary for
Environmental Management

Enclosure

PROPOSED NATIONAL ACADEMY OF SCIENCE FORA

The five proposed fora topics encompass major issues that the Environmental Management program is likely to encounter in the next several years. The Department will work with the Academy to further define the content and range of issues to be evaluated within each fora.

Priority Setting

The Priority Setting forum will examine the process of prioritizing Environmental Management activities, and how the process incorporates societal values, costs, current regulations, and risks to the environment, public health, and worker safety.

Timing and Staging of Activities

The Timing and Staging forum will examine how the Environmental Management program can schedule technology development and remediation/restoration efforts such that cost savings are maximized and risks to the environment, public, and workers are minimized.

Technology

The Technology forum will examine all aspects of how technology can best be developed and utilized to aid the federal remediation process.

Management and Organizational Systems

The Management and Organizational Systems forum will examine the management and organizational systems which are most likely to achieve Environmental Management program goals.

Regulatory Measures

The Regulatory Measures forum will examine how the performance of the Environmental Management program could be improved through regulatory measures such as new statues, revised statues, and revised regulatory agreements.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 27c: Please provide copies of: (a) the charter for the EMAB, a list of the EMAB membership--including the job title, affiliation and address for each member of the EMAB as well as any EMAB subcommittees/working groups/panels, and EMAB's funding level and the source of that funding; (b) the charters/task statements for each of the two ongoing studies by panels of the National Academy of Sciences, as well as a list of the panels' membership--including the job title, affiliation and address for each member of the panels, the panels' funding levels and the source of that funding; (c) the charter for each of the DOIT Committees, a list of each of the DOIT Committee memberships--including the job title, affiliation and address for each member of each DOIT Committee, as well as any DOIT Committee subcommittees/working groups, and each of the DOIT Committee's funding level and the source of that funding; (d) the charter for each of the Site Specific Advisory Boards (SSAB), a list of each of the SSAB memberships--including the job title, affiliation and address for each member of each SSAB, as well as any SSAB subcommittees/working groups/panels, and each of the SSAB's funding level and the source of that funding.

Answer: Attached for the record are the DOIT Committee December 9, 1994, Charter, membership information for the DOIT Committee and Working Groups reporting to the DOIT Committee. The Department of Energy's Office of Environmental Management provided $1.1 million during FY 1995 for this activity.

CHARTER

Federal Advisory Committee
to
Develop On-Site Innovative Technologies
for
Environmental Management

1. PURPOSE: This charter renews the "Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management" (DOIT Committee), for performing their duties and responsibilities under provisions of the Federal Advisory Committee Act (FACA), 5 U.S.C. App. 2 section 14(a)(2)(a).

2. AUTHORITY: It is determined that continuance of the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management is in the public interest and supports the Departments of Defense, Interior, and Energy and the Environmental Protection Agency in performing their duties and responsibilities under Section 120 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Section 6001 of the Resource Conservation and Recovery Act (RCRA), and other authorities pertaining to environmental restoration and waste management at Federal and non-Federal sites.

3. OBJECTIVE AND SCOPE OF ACTIVITY: The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management will serve as the primary vehicle for recommending a program that can be adopted to implement a Memorandum of Understanding regarding environmental management in western states. This memorandum was signed in July 1991 by representatives from the U.S. Departments of Defense, the Interior, and Energy, the U.S. Environmental Protection Agency and the Western Governor's Association (WGA), the latter representing twenty western state and territorial governors.

The objective of the Memorandum of Understanding is "to establish a more cooperative approach to development of technical solutions to environmental restoration and waste management problems shared by States, commercial entities, and the Federal Government. The regional approach will serve as a demonstration of principles and practices which may be adopted nationally."

The Memorandum of Understanding's objective is also to encourage cooperation and communication among the Federal signatories and the western governors "in research, development, and demonstration...of cost-effective waste management technologies germane to Federal lands and facilities in western States and insular areas."

The members will also appoint representative(s) to serve on technical work groups, and the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management is authorized to use such limited scope work groups for any purpose consistent with the Charter. The individuals appointed to work groups will represent the following interests in an appropriate mix and balance: State government, Federal agencies, tribal government, public interest groups, environmental groups, waste cleanup industry, waste cleanup support industry, Federal laboratories, universities and colleges, and other interested and affected parties.

Such work groups shall report back to the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management. Work groups have no authority to make decisions on behalf of the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management, nor can they report directly to the FACA Committee host agency.

Appropriate members shall be selected and appointed for the two-year term of the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management charter. A full-time salaried official or regular employee of one of the Federal signatories will serve as the Designated Federal Officer and will be present at all meetings. The Designated Federal Officer is authorized to adjourn any meeting whenever such official determines it to be in the public interest to do so.

The host Federal agency will pay as authorized by 5 U.S.C §5703 travel and per diem expenses for Committee and work group members. Federal employees serving on the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management shall not receive compensation other than their salaries and members may receive reimbursement for travel expenses in accordance with five U.S.C. section 5703. The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management estimated annual operating cost is approximately $700,000.00. In addition, the host agency will provide funding for two work-years of staff support. The Department of Energy (DOE) will be the host Federal agency for this charter period and the DOE's Office of Technology Development within the Office of Environmental Management will provide administrative and process support to the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management. The Deputy Assistant Secretary, Office of Technology Development, Department of Energy, will serve as the Designated Federal Officer.

The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management will meet two times per year at a minimum and will follow FACA guidelines regarding notification and open meetings. Work groups will meet as necessary to carry out support activity for the Committee and will also follow FACA guidelines regarding open meetings.

MEMORANDUM OF UNDERSTANDING
AMONG THE
U.S. DEPARTMENT OF DEFENSE,
U.S. DEPARTMENT OF INTERIOR,
U.S. DEPARTMENT OF ENERGY,
U.S. ENVIRONMENTAL PROTECTION AGENCY, AND
THE WESTERN GOVERNORS' ASSOCIATION
REGARDING ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT

I. Purpose

The purpose of this Memorandum of Understanding (MOU) is to establish a more cooperative approach to development of technical solutions to environmental restoration and waste management problems shared by States, commercial entities, and the Federal government. The regional approach will serve as a demonstration of principles and practices which may be adopted nationally.

II. Objective

To encourage cooperation among the U.S. Department of Defense (DOD), U.S. Department of the Interior (DOI), U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and the Western Governors' Association (WGA) in research, development, and demonstration (RD&D) of cost effective waste management technologies germane to Federal lands and facilities in western states and insular areas, and associated information exchange related to waste management.

III. Background

Hazardous and radioactive waste sites pose unique management, treatment, and disposal problems that must be addressed to ensure protection of public health, welfare, and environment.

The Nation's waste clean-up effort will last at least a generation; its costs promise to be unprecedented. Various complex waste management and environmental restoration problems exist in the West. The signatories to this agreement are committed to a long-term, cost-effective effort to: clean up and restore contaminated Federal lands and sites in Western States; safely dispose of the associated waste; develop methods of minimizing or avoiding the generation of future waste; and share information relating to emerging waste technologies. Cooperative strategies for research, development, and demonstration are required to promote development of new technologies and to assess their effectiveness so that they may be permitted and implemented.

VI. Authentication

This MOU becomes effective upon its signature by all parties. The MOU will continue in effect for five (5) years or until modified by mutual consent. Participation by any signatory member may be terminated at the request of any signatory within ninety (90) days prior notice.

Colin McMillan — 7/22/91
Assis. Secretary of Defense — Date

Secretary of Interior — Date

James D. Watkins — 7/22/91
Secretary of Energy — Date

7/22/91
Administrator of Environmental
Protection Agency — Date

7/22/91
Chairman of the
Western Governors' Association — Date

Mike Sullivan — 7/22/91
Vice Chairman of the
Western Governors' Association — Date

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As of 3-27-95

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QUESTION FOR REPRESENTATIVE ROHRABACHER

Question 27(d): On page 8 of the Attachment, it is stated: "We commit to continued utilization of: (1) an existing Environmental Management Advisory Board (EMAB), (2) two ongoing studies by panels of the National Academy of Sciences, (3) the Development of On-site Innovative Technologies (DOIT) Committees, and (4) Site Specific Advisory Boards that exist at every major cleanup site."

Please provide copies of:

(d) the charter for each of the Site Specific Advisory Boards (SSAB), a list of each of the SSAB memberships-including the job title, affiliation and address for each member of each SSAB, as well as any SSAB subcommittees/working groups/panels, and each of the SSAB's funding level and the source of that funding.

Answer: For the record, attached are the Environmental Management (EM) SSAB Charter (there is only one Environmental Management SSAB, and therefore one charter, with members across the complex); a membership list of the EM SSAB, separated out by site, including the job title, affiliation and address for each member; a list of EM SSAB Subcommittees; and funding levels and sources of funding for the EM SSAB listed by site.

DEPARTMENT OF ENERGY

AMENDED CHARTER

Environmental Management Site Specific Advisory Board

1. Board's Official Designation:

Environmental Management Site Specific Advisory Board

2. Board's Objective, Scope of Activities, and Duties:

The Office of Environmental Management (EM) Site Specific Advisory Board will provide the Assistant Secretary for Environmental Restoration and Waste Management, the Director of the EM Office of Public Accountability and appropriate DOE field site managers involved with the EM programs at the sites with policy information, advice, and recommendations concerning EM environmental restoration, waste management, and technology development activities. The Site Specific Advisory Board will provide input and recommendations on EM strategic decisions that impact future use, risk management, economic development, and budget prioritization activities. In addition, the board will provide advice on any other Environmental Restoration and Waste Management projects which the Assistant Secretary, the Director of the Office of Public Accountability, or DOE field site manager assigns to the Board for review and advice.

The Environmental Management Site Specific Advisory Board will have the following duties:

a. Advise the Department of Energy on the process, content, public participation, and other policy aspects of EM's environmental restoration, waste management, and technology development activities;

b. Issue reports and recommendations;

c. Recommend options to resolve difficult issues faced in the Environmental Restoration and Waste Management program, including site specific clean-up criteria and risk assessment, land use, priority setting, management effectiveness, cost vs. benefit analyses, and strategies for site waste management and disposal facilities;

3. Time Period Necessary for the Board to Carry Out Its Purpose:

Since the task of the board is to advise Environmental Restoration and Waste Management on a succession of projects and issues, the time period required to carry out its purpose is continuing in nature.

4. Official to Whom this Board Reports:

This board will report to the DOE field site managers at the sites represented on the board and the Director of EM's Office of Public Accountability.

5. Agency Responsible for Providing Necessary Support for the Board:

Department of Energy

6. A Description of Duties for Which the Board is Responsible:

The duties of the board are solely advisory and are fully stated in paragraph 2 above.

7. Estimated Annual Operating Expenses in Dollars and Person-Years:

The Department of Energy will provide resources sufficient to conduct its business as well as travel and subsistence [per diem] expenses for eligible members. In fiscal year 1995, estimated costs are $2 million and twenty person-years for all sites. Estimated costs and person-years are the same for following years.

8. Estimated Number and Frequency of Board Meetings:

The board will meet approximately five times per year at each of the sites represented on the board. In addition, the members of the board at each site may be asked to designate a member to participate in an annual national meeting to discuss national issues.

9. Board's Termination Date (if less than 2 years from the date of establishment of renewal):

Not applicable.

10. Subcommittees:

To facilitate the functioning of the board, subcommittees will be formed. The objective of the subcommittees will be to make recommendations to the Site Specific Advisory Board on matters concerning site specific plans and programs. Subcommittees will be organized to focus on site specific concerns and issues impacting the various DOE sites with major EM programs.

11. Members:

a. Appointments shall be made for 2 years to achieve continuity in membership and to make use of the acquired knowledge and experience with the developing EM programs. Board membership shall reflect the full diversity of views in the affected community and region and be composed primarily of people who are directly affected by site clean-up activities. Members may include, but will not be limited to, interested stakeholders from local governments, Indian Tribes, environmental and civic groups, labor organizations, universities, waste management and environmental restoration firms, and other interested parties. Representatives from DOE, the Environmental Protection Agency, and state governments shall be ex-officio members of the board. Selection and appointment of group members shall be accomplished using procedures designed to ensure a diverse board membership and a balance of viewpoints.

b. Approximate number of members: 400. This number is based on 15 to 30 persons for each of the proposed DOE sites.

12. Chair:

The Chair shall be appointed by the Director of EM's Office of Public Accountability and shall serve for a period of 2 years, and may be reappointed for additional terms.

This Charter for the Advisory Board above is hereby approved on:

Date: JUN 10 1994

Marcia L. Morris

Howard H. Raiken
Advisory Committee Management Officer

Date Filed: JUN 10 1994

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Chairperson, Blue Mountain Dineh

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Denver, CO 80202

Steve Tarlton
Colorado Department of Public Health and Environment
RFP Unit
4300 Cherry Creek Drive South
Denver, CO 80222-1530

ENVIRONMENTAL MANAGEMENT SITE SPECIFIC ADVISORY BOARD
SAVANNAH RIVER SITE

1994 MEMBERSHIP

Ms. Julie Arbogast
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Secretary, League of Women Voters

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Office of Fraud and Abuse

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Dataw Island, SC 29920
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Mr. Myles N. Grant
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member, Nature Conservancy

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Accountant

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Drug Counselor, Police Officer

Reverend Walter Jones
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Funeral Director, Minister

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Director, Waste and Sewer Authority

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Founder, Coastal Georgia Land Trust
Member, Sierra Club

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Part-Time Instructor, Nuclear
Engineering Technology

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Former SRS Craftworker,
Member, Richmond City Council

Ms. Patricia Jean (Mitchell)
Tousignant
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Former Teacher, News Columnist
Member: League of Women Voters,
Sierra Club, Audubon Society

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Mr. Jeffrey Crane
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Director Lower Savannah District
218 Beaufort Street, N.E.
Aiken, SC 29801

Ms. Ann Ragan
Federal Facility Liaison
Environmental Quality Control
2600 Bull Street
Columbia, SC 29201

SUBCOMMITTEES TO THE ENVIRONMENTAL MANAGEMENT SITE-SPECIFIC ADVISORY BOARD

Fernald

Waste Disposition Subcommittee (Federal Facilities Compliance Act Monitoring)
Environmental Modeling Subcommittee
Membership Subcommittee

Grand Junction Projects Office (Monticello)

Local Training and Hiring Subcommittee
Health and Safety Subcommittee
Budget Subcommittee
Future Land Use Subcommittee
Cell Design Subcommittee

Hanford

Dollars and Sense Subcommittee
Environmental Restoration Subcommittee
Health, Safety, and Waste Management Subcommittee
Public Involvement Subcommittee
Socioeconomic Impacts Subcommittee

Idaho

Membership Selection Subcommittee
Budget Subcommittee
Procedures Subcommittee
Future Land Use Subcommittee
Prioritization Subcommittee
Spent Nuclear Fuel Subcommittee
Draft Site Treatment Plan Subcommittee
Environmental Restoration Subcommittee

Nevada

Issues Subcommittee
Business Structure Subcommittee
Diversification Subcommittee
Charter Subcommittee
Bylaw Subcommittee
Transportation Subcommittee
Environmental Impact Statement Subcommittee
Environmental Management Funding Subcommittee
Human Resource Subcommittee

Pantex

Budget and Finance Subcommittee
Community Outreach Subcommittee
Nominations and Membership Subcommittee
Policy and Personnel Subcommittee
Training and Programs Subcommittee

Rocky Flats

Plutonium and Special Nuclear Materials Subcommittee
Environmental/Waste Management Subcommittee
Community Outreach Subcommittee
Alternative Use Planning Subcommittee
Site Wide Issues Subcommittee
Executive Subcommittee
Membership Subcommittee (ad hoc)
Personnel and Budget Subcommittee (ad hoc)
Federal Advisory Committee Act Subcommittee (ad hoc)

Savannah River

Bylaws Subcommittee
Membership Nomination and Elections Subcommittee
Budget Subcommittee
Executive Subcommittee
Education Subcommittee
Environmental Restoration Subcommittee
Future Use Subcommittee
Nuclear Materials Subcommittee

ENVIRONMENTAL MANAGEMENT SITE-SPECIFIC ADVISORY BOARD FUNDING LEVELS AND SOURCES

EM SSAB, Fernald Site:

FY 94: 218,450
FY 95: 394,696
FY 96: 152,182
Source: Environmental Restoration

EM SSAB, Grand Junction Projects Office (Monticello):

FY 94: 14,903
FY 95: 87,313
FY 96: 128,907
Source: Environmental Restoration

EM SSAB, Hanford Site:

FY 94: 449,551
FY 95: 782,500
FY 96: 482,170
Source: Waste Management

EM SSAB, Idaho Site:

FY 94: 42,873
FY 95: 140,289
FY 96: 140,289
Source: Environmental Restoration

***EM SSAB, Los Alamos:**

FY 94: 0
FY 95: 35,000
FY 96: 90,000
Source: Environmental Restoration

EM SSAB, Nevada Site:

FY 94: 35,180
FY 95: 76,390
FY 96: 122,390
Source: Environmental Restoration

***EM SSAB, Oak Ridge:**

FY 94: 6000
FY 95: 129,975
FY 96: 257,325
Source: Environmental Restoration

EM SSAB, Pantex Plant:

FY 94: 241.502
FY 95: 350.461
FY 96: 345.063
Source: Defense Programs

EM SSAB, Rocky Flats Site:

FY 94: 208.660
FY 95: 447.103
FY 96: 497.730
Source: Environmental Restoration

***EM SSAB, Sandia:**

FY 94: 38.000
FY 95: 88.000
FY 96: 50.000
Source: Environmental Restoration

EM SSAB, Savannah River Site:

FY 94: 98.063
FY 95: 52.201
FY 96: 52.201
Source: Waste Management

* Because the EM SSAB, Los Alamos, the EM SSAB, Oak Ridge, and the EM SSAB, Sandia are in various stages of the formation process, membership lists are not provided for these boards.

QUESTIONS FROM REPRESENTATIVE ROHRABACHER

Question 28: On page 9 of the Attachment, it is stated: "The Department and/or DOE laboratories currently have Memorandums of Understanding with other Executive Branch entities including: the Department of Defense, Department of Health and Human Services, National Institute of Standards and Technology, Environmental Protection Agency, Department of Agriculture, and Department of Transportation."

Please provide copies of each such Memorandum of Understanding for the record.

Answer: The Department has over 300 such Memorandums of Understanding with other Executive Branch entities. The Memorandums of Understanding cover a wide variety of subjects from detailed instructions for interaction between the Department and the other agency on a specific program, to general program direction and guidance encouraging both agencies to work together in broad program areas. It should be noted that Memorandums of Understanding are not legally binding agreements and are not used by the Department as a vehicle for the transfer of funds. There is no central repository within the Agency at this time for Memorandums of Understanding since each Secretarial Officer develops, signs, and retains their respective Memorandums of Understanding. As an efficient first step to responding to this question, attached is the most current available listing of the Department's Memorandums of Understanding along with several examples of Memorandums of

Understanding between the Department and other Executive Branch entities. The Department would be pleased to provide copies of Memorandums of Understanding if any other additional information is needed.

PAGE 1

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000047	AL	09/12/78	DOD		INDUSTRIAL PLANT EQUIPMENT	PIETACH	505-845-7838	GM04-78AL5365
000054	AL	05/15/67	DOD	ARMY/USACE	COCHITI DAM AND RESERVOIR PROJECT	C. NOHAVA	505-845-6450	GM04-67AL0225
000093	AL	02/28/79	DOD	FCDNA	RECORDS RECONCILIATION & REPORT	C. KOSKOVICH	505-845-5108	GM04-79AL1072
000104	AL	03/28/77	DOD	NAVY	SUP. SERVICES FOR DOE'S NE. RELAY STATION	R. SABRE	505-845-6692	GM04-77AL5228
000113	AL	09/05/72	DOD	NAVY	MK-3	ROSEMARY GERGEN	505-845-5192	GM04-72AL3869
000155	AL	03/12/71	DOD	AIR FORCE	LOADING & UNLOADING OPERATIONS	P. RAMEY	806-477-3180	GM04-71AL0295
000189	AL	01/01/84	DOD	NAVY/NSSC	R&D PROG. FOR NON-NUCLEAR MILITARY TECH.	R. LOWREY	505-845-6047	GM04-84AL5361
000475	AL	07/24/72	DOD		ASSISTANCE TO WEAPONS SYSTEMS EVAL. GROUP	ROSEMARY GERGEN	505-845-5192	GM04-72AL3869
000476	AL	06/14/72	DOD		REIMBURSABLE ASSISTANCE TO DD/T&E	ROSEMARY GERGEN	505-845-5192	GM04-72AL3869
000477	AL	08/08/72	DOD		MILITARY SPECS.-MANUALS, TECH NUC. WEAPON	ROSEMARY GERGEN	505-845-5192	GM04-72AL3869
000478	AL	08/21/64	DOD	AIR FORCE	RESEARCH, DEVELOPMENT & TEST SUPPORT	ROSEMARY GERGEN	505-845-5192	GM04-64AL3869
000479	AL	01/15/76	DOD	AIR FORCE	NATIONAL ATOMIC MUSEUM	ROSEMARY GERGEN	505-845-5192	GM04-76AL3870
000480	AL	07/12/72	DOD	FCDNA	SUPPORT SERVICES	ROSEMARY GERGEN	505-845-5192	GM04-72AL3870
000481	AL	09/11/75	DOD	AIR FORCE	DOE AF TEXTILE PARACHUTE AGREEMENT	ROSEMARY GERGEN	505-845-5192	GM04-75AL3870
000482	AL	07/06/78	DOD	ARMY	PERSHING II	ROSEMARY GERGEN	505-845-5192	GM04-78AL3870
000484	AL	04/08/75	DOD	AIR FORCE	TONOPAH TEST RANGE	ROSEMARY GERGEN	505-845-5192	GM04-75AL3871
000487	AL	10/12/73	USDA		ASSISTANCE TO APHIS	ROSEMARY GERGEN	505-845-5192	GM04-74AL3871
000490	AL	06/16/77	DOD	AIR FORCE	MK12A	ROSEMARY GERGEN	505-845-5192	GM04-77AL3871
000491	AL	02/11/77	DOD	AIR FORCE	AL/BASE INSTALLATION SEC. SYS. PRGM. OFC.	ROSEMARY GERGEN	505-845-5192	GM04-78AL3871
000492	AL	12/31/84	STATE OF CO		UMTRA PROJECT	M. MATTHEWS	505-845-4628	GM04-85AL3877
000494	AL	02/13/89	GSA		UTILITY SERVICE MAINTENANCE	E. BEAN	816-997-3341	GM33-89AL5360
000495	AL	09/16/82	DOD	AIR FORCE	DOE/AF NEW MATERIAL & STOCKPILE PROGRAM	N. DIENES	505-845-6280	GM04-64AL0160
000497	AL	04/05/68	DOD	AIR FORCE	NUCLEAR WEAPONS TRAINING	ROSEMARY GERGEN	505-845-5192	GM04-68AL0253
000499	AL	05/14/82	DOD	AIR FORCE	MK 21	ROSEMARY GERGEN	505-845-5192	GM04-83AL2053
000500	AL	03/25/83	DOD	NAVY.	MK5 REENTRY BODY	ROSEMARY GERGEN	505-845-5192	GM04-83AL2327
000501	AL	03/23/83	DOD	ARMY/USACE	CONSTRUCTION MANAGEMENT SERVICES	R. HANSON	505-845-8210	GM04-84AL2636
000502	AL	09/07/84	DOD	AIR FORCE	MK21	ROSEMARY GERGEN	505-845-5192	GM04-84AL2691
000506	AL	03/27/86	DOD	AIR FORCE	AIRCRAFT MONITOR & CONTROL SYSTEMS	ROSEMARY GERGEN	505-845-5192	GM04-84AL3053
000507	AL	08/12/92	CTY OF AMARILLO		EOC OPERATIONS	JACK DENNIS	806-477-3176	GM04-85AL3131
000508	AL	04/09/85	DOD	AIR FORCE	RELEASE OF PUB. INFO RE ACCIDENTS AT KAFB	DAVID JACKSON	505-845-5699	GM04-85AL3256
000509	AL	05/15/79	STATE OF CO		ENVIRONMENTAL SAFETY	A. WHITEMAN	505-845-6280	GM04-79AL3863
000510	AL	03/06/85	GSA		OFFICE AUTOMATION SUPPORT	A. WHITEMAN	505-845-6280	GM04-85AL3864
000511	AL	09/30/80	UNIV OF CO		EMERGENCY SUPPORT	A. WHITEMAN	505-845-6280	GM04-81AL3864
000512	AL	01/01/78	ST. LUKES HPTL		MEDICAL TREATMENT	A. WHITEMAN	505-845-6280	GM04-78AL3864

MOU LISTING BY CONTROL NUMBER

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SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000513	AL	06/08/83	DOC	NOAA	EMERGENCY SUPPORT	A. WHITEMAN	505-845-6280	GM04-83AL3864
000514	AL	11/02/74	STATE OF CO		PLANT SECURITY	A. WHITEMAN	505-845-6280	GM04-74AL3865
000515	AL	11/27/84	DOD		PLANT SECURITY	A. WHITEMAN	505-845-6280	GM04-85AL3865
000517	AL	02/13/86	DOD	ARMY	DOE-AL TESTS AT WHITE SANDS MISSILE RANGE	A. CHERNOFF	505-845-4094	GM04-86AL3865
000518	AL		DOD	ARMY	TENANT RESPONSIBILITIES FOR MAIN/REP AT RM	A. WHITEMAN	505-845-6280	GM04-80AL3865
000519	AL	03/04/54	DOD		STOCKPILE CONTAINERS	ROSEMARY GERGEN	505-845-5192	GM04-54AL3865
000521	AL	07/29/52	DOD	AIR FORCE	MUTUAL OPERATING AGREEMENT	ROSEMARY GERGEN	505-845-5192	
000522	AL	12/04/59	DOD	DASA	MAINTENANCE SUPPORT	ROSEMARY GERGEN	505-845-5192	
000523	AL	12/03/54	DOD		CATALOGING ATOMIC WEAPON MATERIAL	ROSEMARY GERGEN	505-845-5192	GM04-54AL3866
000524	AL	04/23/65	DOD	DASA	ATOMIC WEAPONS MATERIAL	ROSEMARY GERGEN	505-845-5192	GM04-65AL3866
000525	AL	01/22/53	DOD		MISSILE & ROCKET RESPONSIBILITIES	ROSEMARY GERGEN	505-845-5192	GM04-53AL3866
000526	AL	08/06/69	DOD	AIR FORCE/AFLC	SUPPORT OF AEC/AFLC SAMPLING PROGRAMS	ROSEMARY GERGEN	505-845-5192	GM04-69AL3866
000527	AL	06/06/72	DOD	NAVY	AEC/NAVY NEW MATERIAL & STOCKPILE PROGRAM	ROSEMARY GERGEN	505-845-5192	GM04-72AL3866
000528	AL	06/10/70	DOD		ACCIDENT RESPONSE	ROSEMARY GERGEN	505-845-5192	GM04-70AL3867
000529	AL	12/10/64	DOD		JOINT TASK FORCE 2	ROSEMARY GERGEN	505-845-5192	GM04-65AL3867
000530	AL	12/10/63	DOD	NAVY	DOE/NAVY NUC. BOMB-AIRCRAFT WEAP. SYS.	ROSEMARY GERGEN	505-845-5192	GM04-64AL3867
000531	AL	06/06/72	DOD	NAVY	QUAL. ASSURANCE TEST & NEW FLIGHT PROG.	N. DIENES	505-845-6280	GM04-72AL3867
000532	AL	07/11/67	DOD	NAVY	GUIDANCE AGREEMENT	R. LOWREY	505-845-6047	GM04-70AL3867
000533	AL	06/21/66	DOD	NAVY	USN MK3 ARMING & FUZING SYSTEM DEV.	ROSEMARY GERGEN	505-845-5192	GM04-66AL3868
000534	AL	09/25/69	DOD	ARMY	MUTUAL ASSISTANCE AGREEMENT	R. LOWREY	505-845-6047	GM04-69AL0213
000536	AL	07/20/70	DOD	DASA	FACILITIES USE/MANZANO BASE NM	ROSEMARY GERGEN	505-845-5192	GM04-70AL3868
000537	AL	07/30/69	DOD	AIR FORCE	RELIABILITY ASSESSMENT	ROSEMARY GERGEN	505-845-5192	GM04-70AL3868
000538	AL		DOD	NAVY	STOCKPILE RELIABILITY ASSESSMENT PROGRAM	N. DIENES	505-845-6280	GM04-68AL3868
000540	AL	06/26/70	DOD	AIR FORCE	WARHEAD 72 (W72)	ROSEMARY GERGEN	505-845-5192	GM04-68AL3869
000541	AL	05/07/71	DOD	DASA	US/UK AGREEMENT FOR COOPERATION	ROSEMARY GERGEN	505-845-5192	GM04-71AL3869
000545	AL	02/01/71	DOD	ARMY	NUCLEAR WEAPONS TRAINING	ROSEMARY GERGEN	505-845-5192	GM04-71AL0302
000546	AL	04/13/89	DOD	FCDNA	SALE/TRANS/DEL OF DOE NUC. WEAPONS TO DOD	ROSEMARY GERGEN	505-845-5192	GM04-89AL5364
000548	AL	02/07/80	DOD	AIR FORCE	JOINT PROJECTS	ROSEMARY GERGEN	505-845-5192	GM04-80AL3877
000549	AL	05/30/72	DOD	NAVY	NUCLEAR WEAPONS TRAINING	ROSEMARY GERGEN	505-845-5192	GM04-72AL0313
000550	AL	01/01/68	DOI		EMERGENCY SUPPORT	A. WHITEMAN	505-845-6280	GM04-68AL3888
000553	AL	11/04/70	DOD	FCDASA	JTG OPERATION	ROSEMARY GERGEN	505-845-5192	GM04-70AL3866
000554	AL	12/30/77	DOD	NAVY	MK4 ARMING, FUZING & FIRING ASSEMBLY	ROSEMARY GERGEN	505-845-5192	GM04-78AL3870
000555	AL	07/03/86	GSA		INTERAGENCY FLEET MANAGEMENT SYSTEM (IFMS)	BELLOWS	505-843-5105	GM32-86AL3712
000556	AL		DOD	DARPA	ARMOR/ANTI-ARMOR PROGRAM	JAMES HOYAL	505-845-6251	PROPOSED MOU

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SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000564	AL	03/04/87	USDA	FOREST SERVICE	USE OF USDA NATIONAL FOREST LANDS (CIBOLA)	C. NOHAVA	505-845-6450	GM04-87AL4288
000565	AL	04/16/87	DOD	AIR FORCE	SEC. CRYPTOGRAPHIC UNIT/SMALL ICBM PROGRAM	GUIDICE	505-845-6038	GM32-87AL3716
000566	AL	06/23/87	DOI	BUR OF INDIAN AFFAIR	ENVIR. SAMPLING AT PUEBLO OF SAN ILDEFONSO	H. VALENCIA	505-845-5105	GM32-87AL3716
000584	AL	07/09/87	DOL	MSHA	SAFETY INSPECTIONS AT WIPP	JOHN ARTHUR	505-845-5985	GM04-87AL5363
000586	AL	07/16/87	GE&ST. PETERSB.		PRESIDENT'S PARTNERSHIP IN EDUCATION PROG.	E. PATENAUDE	813-541-8196	GM04-87AL5364
000587	AL	09/02/87	DOD	ARMY	JOINT AL AND ARMY NMSFTP, NMSLTS & NWSRAP	RALPH LEVINE	505-845-2040	GM04-87AL4550
000610	AL		STATE OF CO		ENVIRONMENTAL CLEAN-UP EFFORTS AT RF	BRUCE TWINING	505-845-6049	PROP MOU/AMEN
000612	AL		DOD	AIR FORCE	W89 WARHEAD & ASSOC. JOINT TEST ASSEMBLY	DEBORAH MONETTE	505-845-2245	PROPOSED MOU
000613	AL	05/26/89	DOD	NAVY	DEV., PRODUCTION & DEPLOYMENT OF B90	ROSEMARY GERGEN	505-845-5192	GM04-89AL5819
000615	AL	08/03/88	OHIO EMA		MOUND PLANT ENVIRONMENTAL/EMERGENCY MATTER	MICHAEL REKER	513-865-3254	GM04-88AL5361
000664	AL	08/12/92	CTY OF AMARILLO		MUTUAL AID IN FIRE FIGHTING	JACK DENNIS	806-477-3176	GM04-89AL4211
000743	AL	02/03/67	NSA		DOE ASSISTANCE TO NSA	R. LOWREY	505-845-6047	GM04-67AL0215
000744	AL	03/27/69	DOD	FCDASA	PRODUCT CHANGE PROPOSAL PROGRAM	ROSEMARY GERGEN	505-845-5192	GM04-69AL0070
000745	AL	04/20/67	DOD	AIR FORCE	JOINT DROP TEST & MISSILE FIRING PROGRAM	N. DIENES	505-845-6280	GM04-69AL0205
000746	AL	01/16/69	NASA		ASSISTANCE PROCEDURES	R. LOWREY	505-845-6047	GM04-69AL3867
000747	AL	05/12/72	FAA		COORD OPERATION/CONTROLLED FIRING AREA	P. RAMEY	806-477-3180	GM04-72AL0295
000748	AL	09/09/74	DOD	AIR FORCE	ALERT PADS 4 & 5 AVAILABLE TO SAC AND MAC	P. RAMEY	806-477-3180	GM04-74AL0315
000749	AL	09/06/74	PVTI		CONDUCT FIREFIGHTING TRAINING EXERCISES	E. PATENAUDE	813-541-8196	GM04-74AL0350
000750	AL	09/04/75	DOD		DEVELOPMENT OF LIAISON PROCEDURES WITH DOD	S. GUIDICE	505-845-6038	GM04-75AL0348
000751	AL	08/08/75	CTY MIAMISBURG		ALTER THE CANAL/PROVIDE CONTINUED COORD.	J. MORLEY	513-865-3597	GM04-75AL0358
000752	AL	12/23/75	DOD		TEMP STORAGE/SHIPMENTS AT DOD FACILITIES	M. STRONES	505-845-5218	GM04-76AL5360
000753	AL	04/10/70	ST ANTHONY HOS		PERSONNEL MEDICAL TREATMENT & CARE	P. RAMEY	806-477-3180	GM04-76AL5365
000754	AL	02/24/78	NRC		MANAGEMENT POLICY FOR DOE AND NRC	R. LOWREY	505-845-6047	GM04-78AL5360
000755	AL	10/22/79	DOD	AIR FORCE	USE OF ADP FACILITIES/MATERIALS/SERVICES	R. LOWREY	505-845-6047	GM04-79AL0021
000756	AL	07/01/79	SEMINOLE	FIRE DEPARTMENT	FIRE FIGHTING SUPPORT	E. PATENAUDE	813-541-8196	GM04-79AL5364
000757	AL	07/11/80	JEFFERSON CTY	AIR CONTROL TOWER	SAFETY/COORD FOR DOE RADIOACTIVE FLIGHTS	A. WHITEMAN	505-845-6280	GM04-80AL5365
000758	AL	03/31/81	PR&FD CORP.		NUCLEAR FUEL	R. SABER	505-845-6692	GM04-81AL1711
000759	AL	09/29/81	EPRI		ELECTRIC ENERGY PARTICIPATION AGREEMENT	R. LOWREY	505-845-6047	ANNEX EFF. 1/
000760	AL	12/24/81	DOD	USAF/JCMP	JOINT CRUISE MISSILES PROJECT	ROSEMARY GERGEN	505-845-5192	GM04-82AL5360
000761	AL	03/30/82	DOD	AIR FORCE	DSP RADIATION DET. COMPATIBILITY PROGRAM	R. LOWREY	505-845-6047	GM04-85AL5361
000762	AL	10/15/83	DOD	NAVY	W81 NUCLEAR WARHEAD	ROSEMARY GERGEN	505-845-5192	GM04-83AL1241
000763	AL	12/28/82	NEW MEXICO	REVENUE DIV.	GROSS RECEIPT TAXES	J. RANDALL	505-845-5167	GM04-83AL2260
000764	AL	01/22/90	NV		NEVADA TEST SITE OPERATIONS	AL CHERNOFF	505-845-4094	
000765	AL	06/29/83	DOI	BUR OF LAND MGMT	PUBLIC LANDS WITHDRAWAL FOR WIPP CONSTR.	JOHN ARTHUR	505-845-5985	GM04-83AL5363

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000766	AL	06/15/83	FBI		SWAT ASSIST. FOR EOC EXERCISES TRAINING	E. PATENAUDE	813-541-8196	GM04-83AL5364
000767	AL	02/14/83	US ATTORNEY		COORDINATE PROSECUTION OF SERIOUS OFFENSES	E. PATENAUDE	813-541-8196	GM04-83AL5364
000768	AL	12/07/83	EDDY COUNTY		FIRE PROTECTION	JOHN ARTHUR	505-845-5985	GM04-84AL2541
000770	AL	07/08/85	NRC		STATUTORY RESPONS/TITLE 1 OF UMTRCA	M. MATTHEWS	505-845-4628	GM04-85AL2603
000771	AL	10/01/84	FBI		SECURITY AT AL/LAAO	MISKOWICZ	505-845-6293	GM04-85AL3865
000772	AL	03/27/85	GATES (INDIV)		PAO USE OF 4.55 ACRE PLOT OF LAND	E. PATENAUDE	813-541-8196	GM04-85AL5188
000773	AL	02/02/85	DOD		NON-NUC. MUNITIONS TECH. R&D COOP. PROG.	R. LOWREY	505-845-6047	GM04-85AL5361
000774	AL	08/12/92	CARSON CNTY TX		EOC OPERATIONS	JACK DENNIS	806-477-3176	GM04-85AL3238
000775	AL	01/04/85	FBI		COOPERATION RE THREAT/THEFT/SABOTAGE	P. RAMEY	806-477-3180	GM04-85AL5362
000776	AL	12/03/85	M&H		SECURITY SUP. TO PANTEX SECURITY FORCES	P. RAMEY	806-477-3180	GM04-85AL5362
000777	AL	02/26/86	CSX TRANS		DOE ACCESS TO LAND OWNED BY CSX	E. PATENAUDE	813-541-8196	GM04-86AL3776
000780	AL	03/09/87	DOD	AF/NAVY	PARACHUTES & AIRCRAFT SUPPORT	R. HYMER	505-844-7205	GM04-87AL4356
000781	AL	12/10/87	DOD	AIR FORCE	MK21 REENTRY VEHICLE SM. ICBM MISSILE SYS.	ROSEMARY GERGEN	505-845-5192	GM04-87AL4378
000782	AL	06/01/87	GSA		INTERAGENCY FLEET MGMT SYS (IFMS) SNL, ALB	A. CHERNOFF	505-845-4094	GM04-87AL4464
000783	AL	08/26/87	DOD	ARMY/USACE	COE REAL ESTATE SERVICES	C. NOHAVA	505-845-6450	GM04-87AL5214
000784	AL	04/20/87	DOD		DOE SHIPMENTS/TEMP STORAGE AT DOD INSTALL.	R. SABRE	505-845-6692	GM04-87AL5360
000785	AL	09/25/87	CTY/ALBUQUERQUE	POLICE DEPARTMENT	LOAN OF AN ARMORED VEHICLE VEHICLE AT SNLA	D. JEROME	505-845-9187	GM04-87AL5363
000787	AL	04/17/87	GSA		INTERAGENCY FLEET MGMT SYS (IFMS) AT RFAO	A. WHITEMAN	505-845-6280	GM04-87AL5820
000788	AL	04/20/88	GSA		GSA INTERAGENCY FLEET MGMT SYS. SERVICES	P. RAMEY	806-477-3180	GM04-88AL4210
000789	AL	07/25/88	DOD	NAVY	ESTAB BASIS FOR PRODUCT AND USE OF THE W88	D. GURULE	505-845-5151	GM04-88AL5360
000790	AL	03/22/88	VA ADMIN		RESEARCH AND DEVELOPMENT RELATED SERVICES	R. LOWREY	505-845-6047	GM04-88AL5361
000791	AL	09/09/88	FBI		FED RESPONSE TO TERRORISM/SABOTAGE, ETC.	MICHAEL REKER	513-865-3254	GM04-88AL5361
000792	AL	04/15/88	SYCAMORE HOSP		EMERGENCY HOSPITAL CARE	MICHAEL REKER	513-865-3254	GM04-88AL5361
000793	AL	08/12/92	RANDALL CNTY TX		EOC OPERATIONS	JACK DENNIS	806-477-3176	GM04-88AL3238
000794	AL	07/26/88	PINELLAS CNTY	SHERIFF'S OFFICE	SECURITY GENERAL PRACTICE PROCEDURES	E. PATENAUDE	813-541-8196	GM04-88AL5362
000795	AL	06/03/88	LEA HOSPITAL		ESTABLISHMENT OF AN ERTC FOR WIPP	NELSON	505-571-2102	GM04-88AL5363
000796	AL	06/15/88	CTY OF CARLSBAD		ALTERNATE EOC AT LIVING DESERT STATE PARK	JOHN ARTHUR	505-845-5985	GM04-88AL5363
000797	AL	10/05/87	DOD	AIR FORCE	OP. INSTRUCTIONS RE SNLA SECURITY	JEROME	505-845-9651	GM04-88AL5363
000798	AL	08/19/88	PINELLAS CNTY	EMERG MGT ADMIN	EMERGENCY RESPONSE PROC AT PINELLAS PLANT	E. PATENAUDE	813-541-8196	GM04-88AL5364
000800	AL	02/21/89	NOAA		NATIONAL SECURITY EMERGENCY PREPAREDNESS	P. RAMEY	806-477-3180	GM04-88AL4210
000801	AL	10/01/88	CTY MIAMISBURG	FIRE DEPARTMENT	MUTUAL FIREFIGHTING AND EMERGENCY RESPONSE	MICHAEL REKER	513-865-3254	GM04-89AL5361
000802	AL	10/05/88	GMC		ESTAB OF EMERGENCY RADIOLOGICAL TREATMENT	JOHN ARTHUR	505-845-5985	
000803	AL	07/07/88	PINELLAS CNTY	SHERIFF'S OFFICE	PROVIDES LOAN OF AUTOM (M-16) TO PCSO	E. PATENAUDE	813-541-8196	GM04-89AL5363
000804	AL	11/03/88	CTY MIAMISBURG		MUTUAL AID	MICHAEL REKER	513-865-3254	GM04-89AL5364

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000805	AL	12/07/88	USPC		RESEARCH & DEVELOPMENT COOP. PROGRAM	A. CHERNOFF	505-845-4094	GM04-89AL5750
000806	AL	03/14/89	DOD	AIR FORCE	ADOPT A MUSEUM PROGRAM	HEXLEP	505-845-4223	GM04-89AL5819
000807	AL	04/20/89	OEMA		COOPERATION IN EMERGENCY SITUATIONS	MICHAEL REKER	513-865-3254	GM04-89AL5819
000808	AL	04/15/89	DOD	AIR FORCE	SUPPORT FOR "PEACEKEEPER CHALLENGE 89"	M. STRONES	505-845-5218	GM04-89AL5819
000809	AL	08/30/89	DOD	AIR FORCE	RESEARCH & DEVELOPMENT RELATED SERVICES	J. MORLEY	505-774-3271	GM04-89AL5877
000810	AL	12/17/74	LOS ALAMOS	POLICE DEPARTMENT	TRAFFIC CONTROL BY THE LOS ALAMOS POLICE	H. VALENCIA	505-843-5105	GM32-75AL5362
000811	AL	01/30/75	FBI, ET AL.		SUPPORT TO LANL/LIMITED HOSTILE INCIDENTS	H. VALENCIA	505-843-5105	GM32-75AL5362
000812	AL	09/22/83	DOJ	US ATTORNEY'S OFC	FEDERAL OFFICERS ARREST PROCEDURES	BELLOWS	505-843-5105	
000813	AL	11/29/85	LA MED CTR		PROVIDE MEDICAL CARE AND TREATMENT TO LAB	BELLOWS	505-843-5105	GM32-86AL3709
000814	AL	06/23/86	ST VINCENT HOSP		PROVIDE MEDICAL CARE TO LAB WORKERS	BELLOWS	505-843-5105	GM32-86AL3709
000815	AL	12/21/87	NTSB		INVESTIGATION OF PUBLIC AIRCRAFT ACCIDENTS	BELLOWS	505-843-5105	GM32-87AL5362
000816	AL	07/20/88	DOD/NMSHD/ET AL	USACE	HIGHWAY ENVIRONMENTAL IMPACT AGREEMENT	BELLOWS	505-843-5105	GM32-88AL5320
000817	AL	01/10/89	NMCB		LOS ALAMOS VENDING FACILITIES OPERATIONS	BELLOWS	505-843-5105	GM32-89AL5729
000818	AL	10/30/84	FBI		COOP. REGARDING THREATS/THEFT/SABOTAGE	E. BEAN	816-997-3341	GM33-84AL5364
000819	AL	01/15/85	ST OF MO		ENVIRONMENTAL/NATURAL DISASTER INCIDENTS	E. BEAN	816-997-3341	GM33-85AL3877
000820	AL	02/15/88	CASS CNTY	SHERIFF'S DEPARTMENT	DOE/SECOM TRANSCEIVER CRIMINAL INCIDENTS	E. BEAN	816-997-3341	GM33-88AL5363
000821	AL	02/11/87	KCMPD		PROVIDES LOAN OF 2 LIGHT ARMORED VEHICLES	E. BEAN	816-997-3341	GM33-87AL5363
000953	AL	05/17/89	DOI	BUR OF LAND MGMT	ENVIR INVESTIGATIONS/BLM ADMIN LANDS IN CO	C. NOHAVA	505-845-6450	
000954	AL	12/31/80	DOD	ARMY	ARMY-DOE STOCKPILE RELIABILITY ASSESSMENT	LUIS PAZ	505-845-5059	
000955	AL	09/08/76	DOD	FCDNA	MUTUAL SUPPORT SERVICES	AL CHERNOFF	505-845-4094	
000956	AL	11/03/88	CITY OF MIAMIS	CITY FIRE DEPARTMENT	FIREFIGHTING/EMERGENCY RESPONSE AGREEMENT	MICHAEL REKER	513-865-3254	
000957	AL	09/08/89	PINELLAS COUNTY	SHERIFF'S OFFICE	SWAT TEAM COMMITMENT/USE OF DOGS AT PPAO	E. PATENAUDE	813-541-8196	
000959	AL	09/30/86	SNLA	SD 3430	TSD TRAINING BRANCH/SNLA SECURITY DEPT 343	R. SABRE	505-845-6692	
000960	AL	04/24/90	DOD	AIR FORCE	BASE SUPPORT AGREEMENT	AL CHERNOFF	505-845-4094	
000961	AL	10/01/86	SNLA	SEC DEPT 3430	JOINT USE OF SECURITY FORCE FACILITIES	M. STRONES	505-845-5218	
000963	AL	04/08/86	DOD	DEFENSE CONTRACT ADM	CONCERNING CORPORATE ACO PROGRAM FOR MKC B	E. BELL	505-845-4335	
000964	AL	09/07/90	DOD	NCCS	TECH. CONSULTATION & ASSISTANCE	R. LOWREY	505-845-6047	
001032	AL	08/12/92			MUTUAL AID IN FIRE FIGHTING	JACK DENNIS	806-477-3176	GM04-92AL3328
001040	AL	01/14/93	LOS ALAMOS CO		MUTUAL AID AND EMERGENCY RESPONSE	GARY GRANERE	505-667-5105	GM32-92AL8250
001056	AL	11/30/91	PEMSS		EMERG. MEDICAL TRANSPORT SERV. AT PANTEX	JACK DENNIS	806-477-3176	
000287	BC	04/01/86	NRC		PROVIDE JUDICIAL SERVICES TO NRC	BETTY A. HUDSON	703-235-2700	
000247	BPA	05/30/74	USDA	FOREST SERVICE	BPA TRANSMISSION FACILITIES	TIM MURRAY	503-230-4634	
000249	BPA	06/15/77	DOT		BPA BORROWINGS PURSUANT TO PL 93-454	TOM THOMPSON	503-230-3974	
000250	BPA	03/02/79	STATE OF WASH	DEPT OF NATURAL RES	BPA TRANSMISSION FACILITIES ON WASHINGTON	R. EASTERLING	503-230-4677	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000251	BPA	04/25/80	WPPSS		BPA-WPPSS RELATIONSHIPS	JIM LEWIS	509-372-5760	
000253	BPA	02/20/85	EPA		HAZARDOUS SUBSTANCE COORDINATION	ANTHONY MORRELL	503-230-5136	
000254	BPA	09/09/83	ACHP, ET AL.		HISTORIC PRESERVATION OF CULTURAL RESOURCE	CHARLES ALTON	503-230-5878	
000255	BPA	05/08/81	PNWEP & CPC		OVERSIGHT & AUDITING OF BPA FUNDS	LARRY LARSON	503-230-5227	
000257	BPA	01/13/82	TVA		INFORMATION EXCHANGE	LEE JOHNSON	503-230-3000	
000258	BPA	05/01/82	DOD	ARMY/USACE	COOPERATIVE PROCEDURES	ROBERT WINDUS	503-230-5148	MOU UNDER REV
000294	BPA	08/31/82	ST. OF MONTANA	MT DEPT NATURAL RES.	COOPERATIVE PROCEDURES	RANDY MOY	505-585-5093	
000381	BPA	11/29/84	ADV CNCL HIST	STATE OF UTAH SHPO	HISTORIC PRESERVATION OF CULTURAL RESOURCE	CHARLES ALTON	503-230-5878	
000383	BPA	04/26/83	STATE OF IDAHO		INFORMATION EXCHANGE	THOMAS WAGENKOFFER	505-434-6226	
000384	BPA	10/21/85	DOI	BUR OF RECLAMATION	JOINT IDENTIFICATION OF PROJECTS	TOM BLANKENSHIP	206-690-2952	
000385	BPA	01/15/85	EUGENE, ET AL.		LONG RANGE PLANNING	TIM MURRAY	503-230-4634	
000387	BPA	10/21/85	DOI	BUR OF RECLAMATION	PLANNING/DEVELOPING HYDROELECTRIC FAC.	DOUG AUBERG	503-230-4523	
000388	BPA	04/25/88	NW PWR PLAN CNL		FISH AND WILDLIFE PROGRAM MEASURES	JOHN PALENSKY	503-230-4981	
000390	BPA	09/30/81	GSA		OPERATE AND MAINTAIN GSA FACILITIES	E. SCHOER	505-439-2519	
000393	BPA	11/30/71	DOD & DOC	USACE & NOAA	STREAMFLOW FORECASTING IN THE NORTHWEST	R. GRIFFIN	503-230-2102	
000394	BPA	11/16/70	DOD	ARMY/USACE	OPERATION AND MAINTENANCE OF PROJECTS	R. GRIFFIN	503-230-2106	
000395	BPA	10/19/73	DOD	ARMY/USACE	TRANSFER OR PROJECT POWER	S. BERWAGER	503-230-4121	
000396	BPA	06/01/76	DOD	ARMY/USACE	RES. POWER & ENERGY TRANSFER-WILLAKENZIE	S. BERWAGER	503-230-4121	
000397	BPA	03/31/67	DOI	BUR OF RECLAMATION	CROOKED RIVER PROJECT SUPPLEMENTAL POWER	S. BERWAGER	503-230-4121	
000398	BPA	08/23/74	DOI	BUR OF RECLAMATION	TRANSM/TRANSFER/DELIVERY OF POWER & ENERGY	S. BERWAGER	503-230-4121	
000399	BPA	06/06/63	DOI	BUR OF RECLAMATION	POWER & ENERGY/IRRIGATION PUMPING LOADS	S. BERWAGER	503-230-4121	
000400	BPA	12/31/73	DOI	BUR OF RECLAMATION	CHIEF JOSEPH PROJECT-POWER AND ENERGY	S. BERWAGER	503-230-4121	
000401	BPA	09/01/63	DOI	BUR OF RECLAMATION	SOUTHERN IDAHO POWER MARKETING ACTIVITES	S. BERWAGER	503-230-4121	
000402	BPA	03/29/68	DOI	BUR OF RECLAMATION	RESERVED POWER WHEELING FOR IDAHO POWER CO	S. BERWAGER	503-230-4121	
000403	BPA	08/26/40	DOI	BUR OF RECLAMATION	COLUMBIA RIVER PROJECT MARKETING OF POWER	S. BERWAGER	503-230-4121	
000404	BPA	03/31/67	DOI	BUR OF RECLAMATION	CROOKED RIVER PROJECT	S. BERWAGER	503-230-4121	
000405	BPA	04/20/66	DOI	BUR OF RECLAMATION	SPOKANE VALLEY PROJECT-IRRIGATION LOADS	S. BERWAGER	503-230-4121	
000406	BPA	12/02/68	DOI	BUR OF RECLAMATION	SWAN VALLEY SUBSTATION OPERATION/MAINT.	TOM WAGENHOFFER	503-230-3101	
000408	BPA	07/07/83	STATE OF WASH		AGREEMENTS IN AREAS OF MUTUAL CONCERN	CAROLYN WHITNEY	505-399-4136	
000409	BPA	03/01/82	DOI	BUR OF LAND MGMT	TRANS/RELATED FAC. ON LANDS ADM. BY BLM	JIM NORMANDEAU	503-230-4175	
000411	BPA	04/26/83	STATE OF IDAHO		COOPERATIVE PROCEDURES	TIM MURRAY	503-230-4640	
000412	BPA	07/07/83	STATE OF WASH		COOPERATIVE PROCEDURES	TIM MURRAY	503-230-4640	
000413	BPA	02/17/45	DOI	BUR OF RECLAMATION	SUBSTATION SITES AND CROSSINGS	J. COWGER	503-230-3258	
000838	BPA	09/05/89	CPTC		ALTERNATE WORK SCHEDULES	CHARLES RONSHEIMER	503-230-3088	

MOU LISTING BY CONTROL,NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000839	BPA	09/07/89	CPAEC		ALTERNATE WORK SCHEDULES	CHARLES RONSHEIMER	503-230-3088	
000840	BPA	03/22/90	EPA		CLEANUP OF PCB CONTAMINATION	MARK HERMESTON	509-522-6264	
000841	BPA	09/05/89	PDL		ALTERNATE WORK SCHEDULES	CHARLES RONSHEIMER	503-230-3088	
000890	BPA	03/16/83	WPPSS		WNP-2 PROJ. & SCHEDULE AND EMERG. MAINT.	DARREL VANCOEVERING	206-690-2300	
000972	BPA	08/31/82	ST. OF MONTANA		ANNUAL INFORMATIONAL MEETING	RANDY MOY	505-585-5093	
000973	BPA	09/13/67	MULTIPLE		CONSTRUCTION & OP. MALIN SUBSTATION	S. BERWAGER	503-230-4121	AMENDED 03/85
000974	BPA	01/15/68	DOI	BUR OF RECLAMATION	SERVICE TO LOWER VALLEY	S. BERWAGER	503-230-4121	
000980	BPA	04/28/88	ST. OF OREGON		SHARING OF INFORMATION	G. GWINNUTT	503-230-4551	
000981	BPA	01/24/78	DOI	BUR OF INDIAN AFFAIR	FISHERY MITIGATION PROJECTS	JOHN PALENSKY	503-230-4981	
000982	BPA	07/09/90	BC HYDRO POWER		NON-TREATY STORAGE AGREEMENT	JOHN PALENSKY	503-230-4981	
000983	BPA	04/10/89	DOI/TRIBES/ETC.		FISH SPILL	JOHN PALENSKY	503-230-4981	
000984	BPA	12/21/88	ST. OF MONTANA		WILDLIFE MITIGATION AGREEMENT	JOHN PALENSKY	503-230-4981	
000985	BPA	11/07/90	CRITFC		COL. RIVER TREATY SALMON ECONOMIC PROJECT	JOHN PALENSKY	503-230-4981	
000986	BPA	11/29/76	TRIBES & PNRC		COLUMBIA RIVER ANADROMOUS FISHERY RESTOR.	JOHN PALENSKY	503-230-4981	
000304	CH	03/17/89	SEFG		SINGLE EVENT UPSET TEST FACILITY	BARBARA FITZGERALD	516-282-3437	
000311	CH	03/27/85	DOD	ARMY/USACE	CONSTRUCTION RELATED SERVICES	DON BRAY	505-972-2232	
000571	CH	08/25/88	DOD	AIR FORCE	ANTI-MATTER/ADVANCED MOLECULAR CHEMISTRY	BARBARA FITZGERALD	516-282-3437	
000889	CH	06/17/86	DOD	AFWL	NEUTRAL BEAM TEST FACILITY PROGRAM	ROBERT GORDON	516-282-3346	
001035	CH	11/09/92	DOD	ARMY/USATHAMA	HAZARDOUS WASTE	LUIS RIVERA	708-252-2883	
001053	CH		LONGWOOD&FAITH		SUPPORT FOR SCIENCE, MATH & ENG. EDUCATION	BARBARA FITZGERALD	516-282-3437	PROPOSED MOU
001054	CH		RIVERHEAD MS		SUPPORT FOR SCIENCE, MATH & ENG. EDUCATION	BARBARA FITZGERALD	516-282-3437	PROPOSED MOU
001055	CH		SO COUNTRY/ETC		SUPPORT FOR SCIENCE, MATH & ENG. EDUCATION	BARBARA FITZGERALD	516-282-3437	PROPOSED MOU
001060	CH		DOD	USAREUR	RESEARCH/RELATED SERV. TO SUPPORT USAREUR	LUIS RIVERA	708-252-2883	PROPOSED MOU
001061	CH		PMRMA		HAZARDOUS WASTE	LUIS RIVERA	708-252-2823	PROPOSED MOU
000600	CR		TREASURY	FRB OF RICHMOND	DIRECT ELECTRONIC ACCESS	MARK LOOP	301-903-4832	
000965	CR	01/24/90	CREDIT AGENCIES		REFERRAL OF COMMERCIAL DEBT INFORMATION	SMITH ISAAC	301-903-5264	
000966	CR	01/24/90	CREDIT AGENCIES		REFERRAL OF CONSUMER DEBT INFORMATION	SMITH ISAAC	301-903-5264	
001000	CR	11/25/91	TREASURY & IRS	FMS	FEDERAL TAX REFUND OFFSET PROGRAM FOR 1992	OFELIA MOORE	202-586-4860	
000016	DP	12/08/67	DOD	DASA	CUSTODY TRANSFER AND DELIVERY AGREEMENT	CYNTHIA HILLAND	301-903-5636	
000018	DP	10/20/67	USDA	FOREST SERVICE	OPERATION OF RADIO-ELECTRONIC EQUIPMENT	CYNTHIA HILLAND	301-903-5636	
000019	DP	02/02/81	USDA	FOREST SERVICE	BLACK HILLS NAT'L. FOREST SEISMIC STATION	CYNTHIA HILLAND	301-903-5636	
000020	DP	03/23/67	USDA	FOREST SERVICE	PROJECT GASBUGGY	CYNTHIA HILLAND	301-903-5636	
000021	DP	03/15/74	EPA		RADIOLOGICAL SAFETY ACTIVITIES	CYNTHIA HILLAND	301-903-5636	
000022	DP	06/01/71	EPA		RADIOLOGICAL SAFETY ACTIVITIES	CYNTHIA HILLAND	301-903-5636	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000023	DP	12/21/62	GSA		COMMUNICATIONS SECURITY EQUIPMENT	CYNTHIA HILLAND	301-903-5636	
000024	DP	05/10/68	GSA		SHARING EXCHANGE AGREEMENT	CYNTHIA HILLAND	301-903-5636	
000025	DP	05/04/72	HHS		INGESTION OF DETERGENT PRODUCTS	CYNTHIA HILLAND	301-903-5636	
000026	DP	01/01/74	HHS	FOOD & DRUG ADMIN	INHALATION BIOLOGY RESEARCH	CYNTHIA HILLAND	301-903-5636	
000027	DP	10/12/60	HUD		FINANCING FOR FAMILY HOUSING	CYNTHIA HILLAND	301-903-5636	
000028	DP	04/21/81	DOI	BUR OF LAND MGMT	VOLCANISM IN THE AREA OF CRATER FLAT	CYNTHIA HILLAND	301-903-5636	
000029	DP	12/02/59	DOI	NAT'L PARK SERVICE	TRANSFER OF REAL PROPERTY	CYNTHIA HILLAND	301-903-5636	
000030	DP	12/17/62	DOI	BUR OF INDIAN AFFAIR	EASEMENT AGREEMENT	CYNTHIA HILLAND	301-903-5636	
000031	DP	02/01/69	DOI	FOREST SERVICE	FOREST SERVICE USE OF COMPUTER SYSTEM	CYNTHIA HILLAND	301-903-5636	
000033	DP	03/24/74	DOI	BUR OF RECLAMATION	COLORADO RIVER STORAGE PROJECT	CYNTHIA HILLAND	301-903-5636	
000034	DP		DOI	NAT'L PARK SERVICE	LAND TRANSFER	CYNTHIA HILLAND	301-903-5636	
000037	DP	05/27/60	DOD	MIMA	ATMX CARS FOR DOD MOVEMENTS	CYNTHIA HILLAND	301-903-5636	
000043	DP	08/22/79	COAST GUARD		USE OF DOE RESOURCES INCLUDING NEST	JOHN RUDOLPH	301-903-3618	
000052	DP	09/04/75	DOD		NUC. WEAPONS DEV. LIAISON PROCEDURES	JON TODD	703-697-3098	
000053	DP	02/13/68	DOD	ARMY	STOCKPILE RELIABILITY ASSESSMENT	DOTTIE CLINE	301-903-6158	
000060	DP	06/08/76	FBI		RESPONSE TO NUCLEAR THREAT INCIDENTS	JOHN RUDOLPH	301-903-3618	MOD 6/17/82
000063	DP	01/04/74	DOD		AEC WEAPONS BUDGET REQUESTS	CYNTHIA HILLAND	301-903-5636	
000064	DP	09/24/84	DOD		PLANNING AND SUPPORT FOR SAFEGUARD C	IRV WILLIAMS	301-903-5341	BEING SUPERSE
000069	DP	07/25/67	DOD		AIR/GROUND TELEMETERING FREQ. PROVISIONS	CYNTHIA HILLAND	301-903-5636	
000070	DP	05/01/81	DOD		OPERATION OF JOINT ATOMIC INFO EXCH. GROUP	GLEN TAYLER	301-903-4379	
000071	DP	10/20/69	DOD		JOINT ATOMIC WEAPON TECHNICAL INFO PROGRAM	CYNTHIA HILLAND	301-903-5636	
000072	DP	12/24/68	DOD	ARMY/USACE	NUCLEAR PROJECTS SLOPE STABLILITY & SAFETY	CYNTHIA HILLAND	301-903-5636	
000074	DP	03/21/53	DOD		DEV/PROD/STANDARDIZATION OF ATOMIC WEAPONS	JON TODD	703-697-3098	MOU UNDER REV
000077	DP	02/27/80	DOD/FBI		IMPROVISED NUC. DEVICE INCIDENTS RESPONSE	JOHN RUDOLPH	301-903-3618	
000078	DP	06/07/72	DOD	DEFENSE, RES. & ENG.	REIMBUSABLE ASSISTANCE	CYNTHIA HILLAND	301-903-5636	
000080	DP	11/14/66	DOD	ARMY MATERIAL COMM	USE OF FACILITIES, MATERIALS AND SERVICES	CYNTHIA HILLAND	301-903-5636	
000081	DP	04/24/61	DOD	ARMY MUNITIONS COMM	NEW MAT'L. SYSTEMS TEST/STOCKPILE SAMPLING	CYNTHIA HILLAND	301-903-5636	
000082	DP	11/11/62	DOD		NUCLEAR WEAPONS EFFECTS RESEARCH	CYNTHIA HILLAND	301-903-5636	
000091	DP	09/19/62	DOD	DASA	PROD. CHANGES TO NUCLEAR WEAPONS MATERIALS	CYNTHIA HILLAND	301-903-5636	
000095	DP	07/30/74	DOD	FCDNA	AEC WEAPONS QUALITY ASSURANCE PROGRAM	CYNTHIA HILLAND	301-903-5636	
000105	DP	07/11/67	DOD	NAVY	MUTUAL ASSISTANCE	CYNTHIA HILLAND	301-903-5636	
000106	DP	09/29/64	DOD	NAVY	SEA AREA OF SALTON SEA TEST BASE	CYNTHIA HILLAND	301-903-5636	
000111	DP	12/19/61	DOD	NAVY	LOAN OF CRAFT	CYNTHIA HILLAND	301-903-5636	
000112	DP	04/17/73	DOD	NAVY	LASER FUSION RESEARCH	CYNTHIA HILLAND	301-903-5636	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000117	DP	08/19/70	DOD	AIR FORCE	LOAN OF AIRCRAFT TO AEC	CYNTHIA HILLAND	301-903-5636	
000118	DP	08/11/72	DOD	AIR FORCE	LOAN OF AIRCRAFT TO AEC	CYNTHIA HILLAND	301-903-5636	
000119	DP	05/01/84	DOD		DISPOSAL OF RADIOACTIVE WASTE	ELIZABETH JORDAN	301-903-5429	MOU UNDER REV
000120	DP	07/01/56	DOD	AIR FORCE	DROP TESTS OF WEAPONS AND DEVICES	CYNTHIA HILLAND	301-903-5636	
000125	DP	02/05/85	DOD		COOP. R&D PROG./NONNUCLEAR MUNITIONS TECH.	G. D'ALESSIO	301-903-6688	
000126	DP	07/16/84	DOD		STRATEGIC DEFENSE INITIATIVE TECH PROGRAM	JAMES C. BELOTE	301-903-6455	SUP TO 000074
000137	DP	09/08/86	DOD	SDIO	R&D SERVICES TO DOD ON SDI	JAMES C. BELOTE	301-903-6455	BEING SUPERSE
000138	DP	09/07/83	ANL		HISTORICALLY BLACK COLLEGES PROGRAM	ISABEL NEDDOW	301-903-5115	
000145	DP	01/08/81	DOD/FEMA		RESPONSE TO NUCLEAR WEAPONS ACCIDENTS	JOHN RUDOLPH	301-903-3618	
000146	DP	01/16/84	DOD	ARMY	R&D TO IMPROVE NONNUCLEAR MILITARY TECH.	G. D'ALESSIO	301-903-6688	
000148	DP	02/27/68	DOD	AIR FORCE	RELIABILITY ASSESSMENT	CYNTHIA HILLAND	301-903-5636	
000150	DP		DOD	AIR FORCE	NUCLEAR WEAPONS DIAGNOSTIC TEST CAPABILITY	CYNTHIA HILLAND	301-903-5636	
000153	DP	06/14/65	DOD	AIR FORCE	PHOTOGRAPHIC SERVICES	CYNTHIA HILLAND	301-903-5636	
000154	DP		DOD	AIR FORCE	LOGISTICS COMMAND SAMPLING PROGRAMS	CYNTHIA HILLAND	301-903-5636	
000156	DP	07/01/52	DOD	AIR FORCE	RES./DEVELOPMENT/TEST SUPPORT ACTIVITIES	CYNTHIA HILLAND	301-903-5636	
000157	DP	04/05/68	DOD	AIR FORCE	AIR FORCE NUCLEAR WEAPONS TRAINING PROGRAM	CYNTHIA HILLAND	301-903-5636	
000158	DP	01/18/56	DOD	AIR FORCE	CONTROL/CLASSIF. OF PHOTOGRAPHIC MATERIALS	CYNTHIA HILLAND	301-903-5636	
000159	DP	07/01/73	DOD	AIR FORCE	MIXED USER SHIPMENTS	CYNTHIA HILLAND	301-903-5636	
000162	DP	06/15/64	DOD	AIR FORCE	AIRLIFT PARTS & MATERIALS	CYNTHIA HILLAND	301-903-5636	
000163	DP	07/01/64	DOD	AIR FORCE	AIR TRANSPORTATION OF PARTS & MATERIALS	CYNTHIA HILLAND	301-903-5636	
000169	DP	06/12/78	DOD	AIR FORCE	OVERFLIGHT OF RESTRICTED AIRSPACE	CYNTHIA HILLAND	301-903-5636	
000170	DP	03/04/54	DOD		STATEMENT OF THE DIVISION OF EQUIPMENT	CYNTHIA HILLAND	301-903-5636	
000171	DP	12/27/68	DOD	AIR FORCE	EXECUTION AND REVIEW OF AECOP TASKS	CYNTHIA HILLAND	301-903-5636	
000172	DP	09/24/69	DOD	NAVY	MUTUAL ASSISTANCE	CYNTHIA HILLAND	301-903-5636	
000178	DP		CIA		JOINT ACTIVITIES IN RESEARCH AND ANALYSIS	ERIC BRAGG	301-586-1016	CLASSIFIED
000179	DP	05/15/72	DOT	FAA	COORD. OPERATION OF CONTROLLED FIRING AREA	CYNTHIA HILLAND	301-903-5636	
000182	DP	05/27/71	REGNTS/UT STATE		COOPERATIVE ACTIVITIES	CYNTHIA HILLAND	301-903-5636	
000185	DP	06/01/76	DH BALDWIN CO		CONTRACTOR RESEARCH & DEVELOPMENT WORK	CYNTHIA HILLAND	301-903-5636	
000186	DP	08/01/76	EPRI		COOPERATIVE ACTIVITIES	CYNTHIA HILLAND	301-903-5636	
000465	DP	05/12/87	DOD		ATMOSPHERIC RELEASE ADVISORY CAPABILITY	ALVERTON ELLIOTT	301-903-3701	
000467	DP	03/08/77	NRC		EMERGENCY RESPONSES	ALVERTON ELLIOTT	301-903-3701	
000520	DP	09/05/84	DOD		SUPL TO '53 AGREEMENT ON ATOMIC WEAPONS	JON TODD	703-697-3098	SUPL 000074
000596	DP		DOD		LOW INTENSITY CONFLICT (LIC) OPERATIONS	JED SAZAMA	301-903-4051	PROPOSED MOU
000650	DP	04/20/87	DOD		TEMP STORAGE/DOE SHIPMENTS AT MIL. INSTALL	JOHN RUDOLPH	301-903-3618	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000833	DP		DOD	DARPA	ARMOR/ANTI-ARMOR (A3) PROGRAM	TED SAZAMA	301-903-4051	PROPOSED MOU
000969	DP	09/01/88	DOD	OSIA & AFTAC	VERIF OF INTERMED-RANGE NUC. FORCES TREATY	LESLIE A. CASEY	202-586-2151	
000970	DP	08/11/87	DOD	USAF/AFSD	GLOBAL POSITIONING SYSTEM SPACE SEGMENT	DOUGLAS W.DOWNEN	202-586-2123	
000971	DP	12/10/86	DOD	USAF/AFSD	DEFENSE SUPPORT PROGRAM (DSP) SATELLITES	DOUGLAS W.DOWNEN	202-586-2123	
000977	DP	12/18/80	FEMA		CONTINUATION OF RERO TRAINING COURSE	JOHN RUDOLPH	301-903-3618	
000978	DP	08/28/81	DOD		STOCKPILE CONFIDENCE TESTING	IRV WILLIAMS	301-903-5341	
000979	DP	01/17/83	DOD		JOINT NUCLEAR WEAPON ACTIVITIES	JON TODD	703-697-3098	
001004	DP	09/30/91	ST ANTHONY HOSP		CARE OF PATIENTS FROM ROCKY FLATS PLANT	JERRI J. ADAMS	303-966-3098	
001005	DP		UNIV OF COLO		CARE OF PATIENTS FROM ROCKY FLATS PLANT	JERRI J. ADAMS	303-966-3098	PROPOSED MOU
001006	DP		ARVADA FIRE		FIREFIGHTING/EMERGENCY RESPONSE AGREEMENT	JERRI J. ADAMS	303-966-3098	PROPOSED MOU
001019	DP	11/02/92	NASM		TRANSFER OF A "LITTLE BOY" MODEL	TIMOTHY MCCUNE	301-903-5159	
001022	DP		DOD		NAVSTAR GLOBAL POSITIONING SYSTEM	STEPHEN E.HERRICK	202-586-1874	PROPOSED MOU
001025	DP		DOD	SDIO	R&D SERVICES TO DOD ON SDI	LTC NEAL ELY	301-903-5049	SUPERSEDES MO
001026	DP		DOT		IVHS PROGRAM	WILLIAM C.HEARD	301-903-3577	S-1 APP. 5/24
001037	DP		DOD		CONVENTIONAL DEFENSE SCIENCE & TECHNOLOGY	G. J. D'ALESSIO	301-903-3106	PROPOSED MOU
001047	DP		DOD	ARMY	STORAGE FACILITY FOR FISSILE MATERIAL	BOB BAKER	202-586-5867	DRAFT MOU
001062	DP		DOD	DNA	SCIENTIFIC COMPUTING SUP./RELATED SERVICES	STEPHEN R.BERGGREN	301-903-8553	PROPOSED MOU
001063	DP		DARPA/NASA/ETC.		TECH. CONVERSION/REINVESTMENT/TRANSITION	W. CHERNOCK	202-586-7590	PROPOSED MOU
001066	DP	01/06/93	DOD	ARMY	RUSSIAN FACILITY STORAGE OF NUCLEAR MAT'L.	DAVID L. McCONAGHA	301-903-6690	
001070	DP		DOD & FBI		RESP. TO DOM. MALEVOLENT NUC. WEAPON EMER.	L. GORDON-HAGERTY	301-353-3558	PROPOSED MOU
001072	DP		DOD	DNA	SAFEGUARD C PROGRAMS	MICHAEL R.FERRY	301-903-3988	SUPERSEDES MO
000003	EE	04/26/76	DOT		RD&D ACTIVITIES RELAT. TO ENERGY CONSERV.	JOHN J. BROGAN	202-586-1477	
000014	EE	03/03/77	NASA	JPL	CHEMICAL PROCESSES	MARVIN GUNN	202-586-1726	
000469	EE	10/01/85	NASA	LEWIS RESEARCH CTR	SOLAR THERMAL DISTRIBUTION SYSTEMS PROGRAM	MARTIN SCHEVE	202-586-8110	CE/AL EFFORT
000471	EE	02/06/87	NSF		POWER SYSTEMS RESEARCH COOPERATION	DIETRICH ROESLER	202-586-1495	
000577	EE	09/16/84	DOC	NBS	POWER TRANSMISSION LINES	IMRE GYUK	202-586-1482	
000607	EE	12/01/88	DOC	ITA	PROMOTION/EXPORT DEV. OF RENEWABLE ENERGY	ELAINE GUTHRIE	202-586-1719	
000629	EE	08/15/90	VIRGIN ISLANDS		TECH. SUP. ACTIVITIES/U.S. VIRGIN ISLANDS	ERNESTINE GIBSON	202-586-8294	
000643	EE	01/22/91	USDA		R&D EFFORTS IN ENERGY & AGRICULTURE	JOHN FERRELL	202-586-6745	
000644	EE		GSA		FEDERAL RELIGHTING INITIATIVE	LOU HARRIS	202-586-9794	PROPOSED MOU
000648	EE		GSA/PEPCO/DCEO		FEDERAL RELIGHTING INITIATIVE	RICHARD BRANCATO	202-586-5772	PROPOSED MOU
000684	EE	02/11/90	APPLIANCE INDUS		APPLIANCE INDUS.-GOV'T. CFC REPLACEMENT CO	THEODORE KAPUS	202-586-9123	
000832	EE		DOT, ET AL.		NATIONAL MAGNETIC LEVITATION INITIATIVE			DRAFT MOU
000843	EE		EPA, ET AL.		ROOFING RESEARCH AT ORNL	PETER SCOFIELD	202-586-9193	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

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000883	EE	04/01/88	DOD	USAF/AFESC	COOPERATIVE FACILITY ENERGY PROGRAMS	RICHARD BRANCATO	202-586-5772	
000884	EE	10/19/78	DOD		COOPERATIVE ENERGY ACTIVITIES	RICHARD BRANCATO	202-586-5772	
000886	EE	09/29/87	EPA		NATURALLY OCCURRING INDOOR RADON RESEARCH	JOHN TALBOTT	202-586-9455	
000993	EE	08/14/91	SBA		TECHNOLOGY TRANSFER INITIATIVE	PAUL KEARNS	303-231-1378	
000998	EE	11/06/91	EPA		ALTERNATIVE FUEL EMISSIONS R&D PROGRAM	MIKE GUREVICH	202-586-6104	
001023	EE		VARIOUS UNIVS.		NATIONAL RENEWABLE ENERGY & SCIENCE CENTER	CARMINE C.CASTELLANO	202-586-6265	PROPOSED MOU
001031	EE		EPRI		UTILITY WIND TURBINE PERF. VERIF. PROGRAM	RONALD LOOSE	202-586-5630	PROPOSED MOU
001033	EE		DOI	BUR OF RECLAMATION	ACTIVITIES IN SUP OF THE FED WATER & POWER	RONALD LOOSE	202-586-5630	PROPOSED MOU
001052	EE	05/24/93	CARB		USE OF INEL TEST FACILITIES FOR CA'S LEV/C	KENNETH HEITNER	202-586-2198	
001059	EE		HHS		ELEC & MAGNETIC FIELDS RES/PUB INFO DISSEM	ROBERT L. SAN MARTIN	202-586-9275	PROPOSED MOU
001073	EE		EPRI		TRANSPORTABLE BATTERY SYSTEM PROG.	RUSSELL EATON	202-586-1506	
000205	EH	04/15/79	DOD/EPA/ET AL.	FA/FDA/NOAA/NRC	RADIOACTIVE CONTAMINATION	FRITZ WOLFF	301-903-4838	
000206	EH	02/11/69	DOD	DASA	BIKINI ATOLL	TOMMY MCCRAW	301-903-3721	
000207	EH	02/24/83	NRC		RESEARCH PROGRAMS	JOSEPH MAHER	301-903-4453	
000590	EH	01/13/89	INPO		COOP. RELATIONSHIP/NUCLEAR POWER OPERATION	JOHN YODER	301-903-5650	APP.2 EFF 8/9
000625	EH		NIOSH, ET AL.	OSHA/USCG/EPA	WORKER PROTEC. IN HAZARDOUS WASTE INVEST.	JERRY HULMAN	301-903-5299	
000842	EH	12/24/90	HHS		MANAGEMENT OF DOE EPIDEMIOLOGIC STUDIES	ROBERT GOLDSMITH	301-903-4739	
000988	EH		EPA		EMISSION STANDARDS FOR RADIONUCLIDES	KEN DUVALL	202-586-0242	PROPOSED MOU
001001	EH	08/10/92	DOL	OSHA	OCCUPATIONAL SAFETY AND HEALTH PROGRAMS	DENNIS LUBOW	301-903-2075	
001009	EH		HHS	ATSDR	HEALTH ASSESSMENTS & TOXICOLOGICAL PROFILE	BONNIE S. RICHTER	301-903-4501	SUPERSEDES MO
001015	EH	02/21/92	DOI, ET AL.		RONGELAP RESETTLEMENT PROJECT	ROBERT LOESCH	301-903-4443	
001016	EH	06/30/92	DOI, ET AL.		REHABILITATION/RESETTLEMENT OF BIKINI ATOL	R. THOMAS BELL	301-903-3889	
001017	EH		FEMA		NATIONAL DAM SAFETY PROGRAM ACTIVITIES	RICHARD J.SERBU	301-903-2856	PROPOSED MOU
001057	EH	01/19/93	EPA		NUC. WEAPONS COMPLEX RECONFIGURATION PEIS	CAROL BORGSTROM	202-586-4600	
001068	EH		EPA, DOD, ET AL	USACE	COST-SHARED FINAN. ASSIST. TO TAMPA ELEC.	ELMER C. HOLT	202-586-0714	PROPOSED MOU
000430	EI	01/13/84	DOI	US GEOLOGICAL SURVEY	ASSESSMENT OF POTENTIAL URANIUM RESOURCES	HOWARD WALTON	202-584-5500	
000431	EI	09/22/83	HHS	FAMILY SUPPORT	INFORMATION OF HOUSEHOLD DEMOGRAPHICS, ETC	WENDEL THOMPSON	202-586-1119	
000438	EI	06/14/85	DOD	DEFENSE FUEL SUP CTR	ACCESS TO THE EIA-728A REPORTS	CHARLES RINER	202-586-6610	
000847	EI	02/07/90	EPA		STEAM ELEC. PLANT OPER. & DESIGN REPORT	MARY HUTZLER	202-254-5419	
000850	EI	10/03/83	FERC		FERC ACCESS TO COMPUTER FACILITY	KEN VAGTS	202-586-1981	
000240	EM	08/10/84	MAYWD B, NJ		REMEDIAL ACTION/RADIOATIVE WASTE STORAGE	JAMES WAGONER	301-903-8147	
000297	EM	02/11/85	DOD	ARMY	REMEDIAL ACTION/WELDON SPRING CHEM. PLANT	GAIL TURI	301-903-8118	
000298	EM	07/08/85	NRC		URANIUM MILL TAILINGS RADIATION CONTR. ACT	DAVID MATHES	301-903-7220	MOD IN PROCES
000315	EM	12/18/79	NJ DEPT ENV PRO	NJ MIDDLESEX BOROUGH	REMEDIAL ACTION AT MIDDLESEX	JAMES WAGONER	301-903-8147	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000626	EM	01/02/90	EPA		HAZ&MIXED WASTE CLEANUP/MINIMIZATION RD&D	TOM ANDERSON	301-903-7295	
000632	EM	05/01/90	DOD	AFESC/ESL	CIVIL & ENVIRONMENTAL ENGINEERING RD&D	TOM ANDERSON	301-903-7295	
000636	EM	01/07/91	DOD	ARMY/USACE	HAZ/MIXED WASTE CLEANUP/MINIMIZATION R&D	TOM ANDERSON	301-903-7295	
000645	EM	07/12/90	DOD	ARMY/USACE	ENVIRONMENTAL RESTORATION & WASTE MGMT.	TOM ELSASSER	202-586-2979	
000828	EM		DOD		DISPOSAL OF LOW-LEVEL RADIOACTIVE WASTE	E. JORDAN	301-903-7116	PROPOSED MOU
000829	EM		STATE OF IDAHO		STORAGE OF FORT ST. VRAIN SPENT FUEL	LIVINGSTON-BEHAN	202-586-2978	DRAFT MOU
000893	EM	05/21/90	STATE OF IDAHO		ENVIRONMENTAL OVERSIGHT AND MONITORING	LIVINGSTON-BEHAN	202-586-2978	
000894	EM	09/07/90	STATE OF CA		ENVIRONMENTAL MONITORING AND OVERSIGHT	LIVINGSTON-BEHAN	202-586-2978	
000895	EM	07/29/90	STATE OF TEXAS		STATE ENVIRONMENTAL ACTIVITIES SUPPORT	LIVINGSTON-BEHAN	202-586-2978	
000943	EM	06/06/91	DOI	US GEOLOGICAL SURVEY	HAZARDOUS & MIXED WASTE CLEANUP	TOM ANDERSON	301-903-7295	
000987	EM		DOI	U.S. BUREAU OF MINES	HAZARDOUS & MIXED WASTE CLEANUP	TOM ANDERSON	301-903-7295	
000995	EM		NCAA		ADDING MATH/SCIENCE TO NAT'L YOUTH SPORTS	T. CHEE	301-903-7926	PROPOSED MOU
001002	EM	08/10/84	MAYWOOD, NJ		DECONTAMINATION R&D PROJECT	JOHN BAUBLITZ	301-903-8100	
001003	EM		DOI	BUR OF RECLAMATION	SUP. FOR ENVIR. RESTORATION & WASTE MGMT.	DEAN CLARK	301-903-8132	
001018	EM		EPA		CLEANUP OF TRANSURANIC WASTE/RADIONUCLIDES	RANDAL S. SCOTT	202-586-8754	PROPOSED MOU
001029	EM		DOD	ARMY/USATHAMA	HAZARDOUS WASTE	JOANNE SHADEL	509-376-1231	PROPOSED MOU
001044	EM		JAERI		DECOMMISSIONING NUCLEAR FACILITIES	WILLIAM E.MURPHIE	301-903-7216	RENEWS '87 AG
001051	EM		BMFT/GERMANY		MANAGEMENT OF RADIOACTIVE WASTES	DAVE GEISER	301-903-7640	INT'L AGREEME
001050	EP	10/15/92	EPA		GENERAL COOPERATION	HOWARD GRUENSPECHT	202-586-5316	
001067	EP		AID		IMPLEMENTATION OF ENERGY POLICY ACT	STEVE LEE	202-586-7180	PROPOSED MOU
000204	ER	03/09/79	EPRI		COOPERATIVE ACTIVITIES	N. ANNE DAVIES	301-903-4941	
000312	ER	10/10/85	DOC/DOI/EPA,ETC		NAT'L. ACID PRECIPITATION ASSESS. PROGRAM	WALTER WARNICK	301-903-4061	
000319	ER	07/07/86	COMM EUROP COMM		HEALTH & ENVIRON. EFFECTS OF RADIATION	ROBERT WOOD	301-903-3213	
000320	ER	04/08/86	WWHS		COOPERATIVE TECHNICAL ASSISTANCE WITH WWHS	JOHN ORTMAN	202-586-6641	
000603	ER	10/07/88	HHS	NIH	HUMAN GENOME RESEARCH COOPERATION	JOANNE DUPREE	301-903-3064	
000635	ER	07/25/90	DOI		SCIENCE/MATH EDUC. IN NATIVE AM. SCHOOLS	RICHARD STEPHENS	202-586-8949	
000639	ER	09/30/90	STATE OF TEXAS	TNRLC	SUPERCONDUCTING SUPER COLLIDER	KRIS FORSBERG	301-903-6577	
000640	ER	05/18/90	NASA		IMPROVING SCIENCE, ENG. & MATH EDUCATION	RICHARD STEPHENS	202-586-8949	
000646	ER	05/18/90	ARC		IMPROVING SCIENCE/MATHEMATICS EDUCATION	RICHARD STEPHENS	202-586-8949	
000662	ER	08/02/90	DEPT. OF EDUC.		IMPROVING SCIENCE/MATH ED. IN SCHOOLS	RICHARD STEPHENS	202-586-8949	
000826	ER	06/12/90	NSF/NIH/USDA		ARABIDOPSOS THALIANA GENOMIC ANALYSIS	ROBERT RABSON	301-903-2873	
000827	ER	04/19/90	COCA-COLA		IMPROVING SCIENCE/MATH ED.-WASH, DC, AREA	LARRY WOLDT	202-586-2117	
000851	ER	09/15/71	DOI		COOPERATIVE EFFORTS	DON STEVENS	301-903-5565	
000852	ER	04/02/84	NSF/DOI	US GEOLOGICAL SURVEY	CONTINENTAL SCIENTIFIC DRILLING	DON STEVENS	301-903-5565	

MOU LISTING BY CONTROL NUMBER

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000853	ER	06/22/90	DOI	BUR OF RECLAMATION	PROJECT SUPPORT FOR THE SSC PROJECT OFFICE	JAMES CARNEY	301-903-6580	
000854	ER	09/29/87	EPA		INDOOR RADON RESEARCH/TECHNICAL ACTIVITIES	R. WOOD	301-903-3251	
000967	ER	11/20/90	EPA		IMPROVING ENVIRONMENTAL & ENERGY EDUCATION	RICHARD STEPHENS	202-586-8949	
000975	ER		DOD	ARMY/USACE	SUPPORT FOR THE DOE SSC PROGRAM	G. JOHN SCANGO	301-903-6580	
000991	ER	08/15/91	HACU		HISPANIC SERVING INST. PARTNERS PROGRAM	RICHARD STEPHENS	202-586-8949	
000992	ER	07/15/91	CCM		SCIENCE, MATH & ENG. EDUCATION PROGRAMS	RICHARD STEPHENS	202-586-8949	
000997	ER		DOD	ARMY	COOPERATIVE RESEARCH & DEVELOPMENT PROGRAM	JOHN LABARGE	202-586-9747	
001007	ER		CCC		RE CONTRACTS WITH CANADIAN BUSINESSES	DAVID DARUGH	214-708-2586	
001012	ER		NSF		RES. & ED. PROG. RE ADVANCED MATERIALS	ROBBIE DALTON	708-252-2229	PROPOSED MOU
001014	ER	12/07/91	WEST ISLIP HS		SUPPORT FOR SCIENCE, MATH & ENG. EDUCATION	BARBARA F.FITZGERALD	516-282-3437	
001046	ER		NIH		RESEARCH PROJ/BIOLOGICAL & MEDICAL SCIENCE	JOHN LABARGE	202-586-9747	PROPOSED MOU
000209	FE	08/04/80	STATE OF LA		WEST HACKBERRY BRINE DISPOSAL OPERATIONS	J. BARTHOLOMEW	202-586-4415	
000211	FE	02/27/78	STATE OF LA		SPR DEVELOPMENT IN THE STATE OF LOUISIANA	J. BARTHOLOMEW	202-586-4415	
000212	FE	03/19/82	TREASURY DEPT	SYNFUELS OFFICE	TECHNICAL SUPPORT	CHARLES OLENTINE	301-903-4293	
000213	FE	08/23/85	STATE OF ALASKA		FE RESOURCE IDENTIFICATION IN ALASKA	C. B. FOSTER	301-903-2810	
000222	FE	10/08/80	TREASURY DEPT	SYNFUELS OFFICE	PROCEDURES TO PROVIDE RESOURCES	KEITH FRYE	301-903-2098	
000280	FE	06/30/87	DOT & EPA		COLLABORATIVE RESEARCH AT LGFSTF	FRANK LEONE	301-903-2098	
000281	FE	08/21/87	USDA	CCC	SPR PILOT BARTER PROGRAM	J. BARTHOLOMEW	202-586-4415	
000308	FE	10/06/81	GRI		MUTUAL COOPERATION	KEITH FRYE	301-903-2098	
000321	FE	09/13/85	SHPO & COUNCIL		SPR OIL PIPELINE CONSTRUCTION	MELISSA SMITH	504-734-4387	
000450	FE	03/23/81	IEA		COAL- LIQUID MIXTURES	HOWARD FELBUS	301-903-4348	
000451	FE	05/22/79	IEA		ENHANCED OIL RECOVERY STUDIES	GEORGE STOSUR	301-903-2918	
000473	FE		ST OF ILLINOIS		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000559	FE	08/28/87	STATE OF KY		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000560	FE	10/02/87	DOI	BUR OF LAND MGMT	MGMT. OF SURFACE RESOURCES/NOSRS 1, 2 & 3	TOM ALEXANDER	202-586-5561	
000561	FE	02/23/88	EPRI, TVA, ETC.		FLUIDIXED-BED COMBUSTORS - COOPERATIVE R&D	RALPH SCHAFER	304-291-4472	MOD IN PROCES
000567	FE	06/21/79	DOL	MSHA	MINE GEOL./SAFETY/HEALTH/UNDERGR. CONSTR.	J. BARTHOLOMEW	202-586-4415	
000568	FE	10/27/88	STATE OF UTAH		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000569	FE	05/11/87	STATE OF IN		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000589	FE	09/25/87	STATE OF ALA		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000595	FE	02/23/88	STATE OF TEXAS		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000605	FE	09/02/88	STATE OF NM		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000609	FE	10/13/88	STATE OF KANSAS		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000624	FE	08/13/90	USAID & TOP		FED. INT'L ENERGY TRADE/DEV. OPPORTUNITIES	SUE ELLEN WALBRIDGE	202-586-7735	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000634	FE		DOI	BUR OF LAND MGMT	RIGHT-OF-WAY GRANT OVER NPR-2/BUENA VISTA	RON DIXON	805-763-6015	PROPOSED MOU
000668	FE	10/20/83	DOI		WATER SERVICE FROM RUEDI RESERVOIR	ANTON DAMMER	202-586-4685	
000670	FE	09/28/87	TREASURY	CUSTOMS/MARAD	USE OF US FLAG VESSELS DURING SPR DRAWDOWN	J. BARTHOLOMEW	202-586-4415	ANNEX 2/28/88
000671	FE	10/29/82	DOT		CARGO PREFERENCE ACT	J. BARTHOLOMEW	202-586-4415	
000674	FE	03/18/88	ST. OF WYOMIMG		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000675	FE	04/06/83	ST. OF OKLAHOMA		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000676	FE	07/05/88	STATE OF ND		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000677	FE	02/24/89	ST. OF MICHIGAN		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000678	FE		DOD	AIR FORCE	HIGH TEMP/HIGH THERMAL STABILITY JET FUEL	GILBERT MCGURL	412-892-4462	
000679	FE	05/26/88	ST OF LOUISIANA		FE RESOURCE CHAR/RES/TECH DEV & TRANSFER	C. B. FOSTER	301-903-2810	
000742	FE	11/01/88	GSA		IFMS MOTOR VEHICLES	JOE STEPHENS	805-763-6078	GSA/DOE 88-00
000897	FE	09/06/90	STATE OF WYOMIN		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000898	FE	08/19/90	STATE OF TEXAS		FOSSIL ENERGY PARTNESSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000899	FE	09/06/90	STATE OF ARIZON		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000900	FE	08/22/90	STATE OF NEVADA		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000901	FE	09/05/90	STATE OF RI		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000902	FE	08/30/90	STATE OF UTAH		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000903	FE	08/08/90	STATE OF OKLAHO		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000904	FE	08/22/90	STATE OF NEBRAS		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000905	FE	08/28/90	STATE OF SD		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000906	FE	08/27/90	STATE OF LOUISI		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000907	FE	08/28/90	STATE OF KANSAS		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000908	FE	08/28/90	ST. OF GEORGIA		FOSSIL ENERGY PARTNERSHIP PROGRAM	FAITH WILLIAMS	202-586-6660	
000989	FE	07/29/91	STATE OF PA	DEPT PUBLIC WELFARE	CAFETERIA SERVICES FOR PETC	JOHN COLUMBIA	412-892-6219	DE-GM22-91PC9
001034	FE	09/18/92	DOD	ARMY/USACE	RESTORING WATER SUPPLIES AT SPEC. SPR SITE	DAVE JOHNSON	202-586-4733	
001071	FM		EPA		PARTNERSHIP IN THE GREEN LIGHTS PROGRAM	VICTOR P. PETROLATI	202-586-4549	DRAFT MOU
000201	GC	04/20/78	DOJ		REG. LITIGATION/EMERG. PETROLEUM ALLOC ACT	HENRY GILL	202-586-2909	
000229	HR	10/11/85	OFI		DOE ADMINISTRATIVE SUPPORT TO OFI	DANIEL M. STECKLER	202-586-6812	
000231	HR	08/26/87	DOD	ARMY/USACE	REAL ESTATE SERVICES	DON TROST	202-586-1191	AMEND IN PROC
000232	HR	05/21/90	DOD	ARMY	RADIO FREQUENCY COORDINATION/NEW MEXICO	ROBERT LEWIS	301-903-4627	
000233	HR	08/28/90	DOD	AIR FORCE	RADIO FREQUENCY COORDINATION/NEVADA	ROBERT LEWIS	301-903-4627	
000243	HR	10/01/88	DOC	NTIS	PUBLIC SALE OF DOE INFO PRODUCTS/SERVICES	KATHLEEN SAMS	615-576-0487	
000295	HR	10/01/84	DOI		SHARED MICROWAVE SYS IN WAR EMERGENCIES	LARRY WASSON	301-903-2501	
000416	HR	04/28/69	GSA		APPLICABILITY OF FIRMR	APRIL RAMEY	301-903-4764	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000551	HR	03/27/87	FOHO		FOHO FITNESS FACILITIES	PATRICIA ROSE	202-586-9645	
000558	HR	10/01/86	DOC	NTIS	DOE INFO PRODUCTS/SERVICES DISSEMINATION	GENEVIEVE KRAMER	615-576-3469	
000597	HR	08/23/89	GSA		DELEGATION OF LEASING AUTHORITY	DON TROST	202-586-1191	
000620	HR	03/17/89	DOI	BLM/ESO	JOINT RECORDS PROJECT	JOHN ALLEVA	202-586-8842	
000631	HR		DEPT. OF EDUC.		CIVIL RIGHTS COMPLIANCE RESPONSIBILITIES	BARRY HALEY	202-586-2237	PROPOSED MOU
000649	HR	10/03/86	DOD/DOC/NASA		COOPERATIVE INFORMATION MANAGEMENT EFFORTS	JOHN ALLEVA	202-586-8842	
000938	HR	04/08/86	WWHS		PC LOAN TO WOODROW WILSON HIGH SCHOOL	PEGGY DUFOUR	202-586-7970	
000940	HR	03/29/76	DOD	USAF	USE OF RADIO FREQ. IN THE 225-400 MHz BAND	ROBERT LEWIS	301-903-4627	BEING UPDATED
000968	HR		EEOC		INVESTIGATIVE SERVICES	JOHN PAGANO	202-586-2218	PROPOSED MOU
001013	HR		EPA		TECH/MAPPING/ENVIRONMENTAL DATA EXCHANGE	JESSIE RUSHING	615-576-3269	PROPOSED MOU
001042	HR		DEPT. OF STATE		FOREIGN RELATIONS DOCUMENTARY SERIES	BENJAMIN COOLING	301-903-5431	PROPOSED MOU
001065	HR		NORDIC CONSORT.		EXCHANGE OF ENERGY INFORMATION	JOHN ALLEVA	202-586-8842	INT'L AGREEME
000701	ID	04/11/60	CTY/BLACKFOOT		RECIPROCAL FIRE FIGHTING ASSISTANCE	KEN OSBORNE	208-526-0805	DE-GM07-62ID1
000702	ID	09/23/55	CITY OF ARCO		RECIPROCAL FIRE FIGHTING ASSISTANCE	KEN OSBORNE	208-526-0805	DE-GM07-62ID1
000704	ID	09/30/76	DOI		FIRE FIGHTING AND WATER WELLS	GLENN WAUGH	208-526-3712	DE-GM07-76ID0
000707	ID	02/27/80	DOJ/DOD	FBI/USAF	IMPROVISED NUC. DEVICE INCIDENTS RESPONSE	J. P. ANDERSON	208-526-0737	DE-GM07-76ID1
000708	ID	04/05/77	STATE OF IDAHO		ENVIRONMENTAL MONITORING AT INEL	J. P. ANDERSON	208-526-0737	DE-GM07-89ID1
000710	ID	05/01/87	EIRMC		CARE OF INJURED INEL EMPLOYEES	J. P. ANDERSON	208-526-0737	DE-GM07-76ID1
000711	ID	03/26/80	EPRI/GPU/NRC		TMI RESEARCH & DEVELOPMENT	J. P. ANDERSON	208-526-0737	DE-GM07-80ID1
000714	ID	11/28/81	CTY OF ID FALLS		RECIPROCAL FIRE FIGHTING ASSISTANCE	KEN OSBORNE	208-526-0805	DE-GM07-82ID1
000715	ID	03/15/82	NRC		DISP. OF NUC. WASTE AT THREE MILE ISLAND	J. P. ANDERSON	208-526-0737	DE-GM07-82ID1
000717	ID	01/31/83	IDAHO ARMY NG		MACHINE GUN RANGE AT INEL	GLENN WAUGH	208-526-3712	DE-GM07-83ID1
000718	ID	09/10/84	IDAHO FALLS	IFPD	IDAHO FALLS CITY POLICY ASSISTANCE	J. P. ANDERSON	208-526-0737	DE-GM07-84ID1
000722	ID	10/16/86	DOD	USARI	MULTI-DISCIPLINARY TECHNICAL SUPPORT	C. H. OSBORNE	208-526-0093	DE-GM07-85ID1
000723	ID	04/03/85	STATE OF IDAHO	DLE	DOE PROTECTIVE FORCE DEPUTIZATION AT INEL	KEN OSBORNE	208-526-0805	DE-GM07-85ID1
000724	ID	11/30/85	NYSERDA, ET AL.		NUCLEAR FUEL CONSOLIDATION R&D PROJECT	R. J. HOYLES	208-526-1478	DE-GM07-86ID1
000726	ID	05/19/87	DOI	AIRCRAFT SERVICES	CONTRACT AIRCRAFT AND AVIATION MANAGEMENT	BRAD BAUER	208-526-0090	DE-GM07-87ID1
000727	ID	10/24/89	DOD	ARMY	MULTI-DISCIPLINARY TECHNICAL SUPPORT	C. H. OSBORNE	208-526-0093	DE-GM07-87ID1
000728	ID	08/16/87	DOD	USAF/DES	MULTI-DISCIPLINARY TECHNICAL SUPPORT	C. H. OSBORNE	208-526-0093	DE-GM07-87ID1
000729	ID	11/02/87	DOD	USAF/AFSPACECOM/DE	MULTI-DISCIPLINARY ENG. & TECH. SUPPORT	C. H. OSBORNE	208-526-0093	DE-GM07-88ID1
000730	ID	11/02/87	DOD	USAF/RADC	TECH. DEV. IN BASIC & APPLIED RESEARCH	C. H. OSBORNE	208-526-0093	DE-GM07-88ID1
000734	ID	04/12/88	GEOTHERMAL TECH		GEOTHERMAL RESEARCH & DEVELOPMENT	KEN OSBORNE	208-526-0805	DE-GM07-88ID1
000735	ID	01/12/89	DOD	ARMY/YPG	JOINT RESEARCH DEVELOPMENT & ENG. PROGRAMS	C. H. OSBORNE	208-526-0093	DE-GM07-89ID1
000736	ID	10/17/89	DOD	USAF/AFESC	MULTI-DISCIPLINARY ENG./TECHNICAL SUPPORT	C. H. OSBORNE	208-526-0093	DE-GM07-89ID1

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000737	ID	12/28/88	DOC		DETAIL TO IDAHO DEPARTMENT OF COMMERCE	C. H. OSBORNE	208-526-0093	DE-GM07-89ID1
000739	ID	04/19/89	DOD	NAVY/HQMC	MULTI-DISCIPLINARY TECHNICAL SUPPORT	C. H. OSBORNE	208-526-0093	DE-GM07-89ID1
000741	ID	05/24/90	DOD	ARMY/RCAS PMO	INDEPENDENT VALIDATION AND VERIFICATION	C. H. OSBORNE	208-526-0093	DE-GM07-90ID1
000927	ID	08/31/90	US ARMY	MILITARY TRAFFIC	ARTIFICIAL INTELLIGENCE SUPPORT	C. H. OSBORNE	208-526-0093	DE-GM07-90ID1
000928	ID	05/21/90	STATE OF IDAHO		FEDERAL RADIOLOGICAL ASSISTANCE	J. P. ANDERSON	208-526-0737	DE-GM07-90ID1
000929	ID	06/22/90	CANYON SHERIFF		USE OF INEL FIRING RANGE AT CFA	J. P. ANDERSON	208-526-0737	DE-GM07-90ID1
000930	ID	04/24/90	DILLON POLICE		USE OF INEL FIRING RANGE AT CFA	J. P. ANDERSON	208-526-0737	DE-GM07-90ID1
000931	ID	04/24/90	BEAVERHEAD SHER		USE OF INEL FIRING RANGE AT CFA	J. P. ANDERSON	208-526-0737	DE-GM07-90ID1
000932	ID	05/29/90	PROFESS TRAVEL		TRAVEL SERVICES FOR GRAND JUNCTION, CO	ROBERT IVEY	505-326-6003	DE-GM07-90ID1
000933	ID	03/08/90	IDAHO ARMY NG		ENTRY UPON/USE OF FIRING RANGE AT INEL	J. P. ANDERSON	208-526-0737	DE-GM07-90ID1
000934	ID	04/20/90	DOT	FAA	EXPLOSIVES VAPOR DETECTION TECH. EVAL.	C. H. OSBORNE	208-526-0093	DE-GM07-90ID1
000935	ID	03/01/90	DEPT OF ARMY		SYSTEMS ENGINEERING AND TECHNICAL SUPPORT	C. H. OSBORNE	208-526-0093	DE-GM07-90ID1
000936	ID	02/02/90	BOEING		COLLABORATIVE RESEARCH AGREEMENT	C. H. OSBORNE	208-526-0093	DE-GM07-90ID1
000937	ID	12/21/88	WYOMING STATE		RADIOLOGICAL ASSISTANCE RESPONSE	KEN OSBORNE	208-526-0805	DE-GM07-89ID1
000946	ID	06/11/90	DOD	US ARMY WESTERN COMM	INDEPENDENT VALIDATION AND VERIFICATION	C. H. OSBORNE	208-526-0093	DE-GM07-90ID1
000947	ID	10/17/90	ST. OF ILLINOIS	IDNS	NUC. PLANT ANALYZER & RELAPS TECH TRANSFER	C. H. OSBORNE	208-526-0093	DE-GM07-90ID1
000948	ID	09/27/90	DOD	ARMY/1st SPEC FORCE	INEL FIRING RANGE USE AGREEMENT	CLARK BRENT	208-526-1555	DE-GM07-90ID1
000949	ID	09/27/90	GRAND JUNCTION	POLICE DEPARTMENT	INEL FIRING RANGE USE AGREEMENT	CLARK BRENT	208-526-1555	DE-GM07-90ID1
000950	ID	07/01/86	US NAVY	USN CIVIL ENGN.	SELECTED NAVY SHORE ACTIVITIES	C. H. OSBORNE	208-526-0093	DE-GM07-86ID1
000962	ID	03/13/89	DOT	FAA TECH CTR	HERF PROGRAM/ENHANCEMENT OF FLIGHT SAFETY	C. H. OSBORNE	208-526-0093	DE-GM07-89ID1
001041	ID		DOD	USATHAMA	HAZARDOUS WASTE	BARBARA SMITH	208-526-5544	PROPOSED MOU
000226	IE	11/15/76	DOS	AID	COOPERATIVE RELATIONS	HAROLD JAFFE	202-586-6777	
000227	IE	08/30/84	DOC		EMERGENCY PREPARATION AND MOBILIZATION	TAILLIE DEUNIS	202-586-1311	
000647	IE	07/18/89	ICAF		DOE CHAIR AT ICAF	JEANNE BOLEAN	202-586-5094	
000941	IE	10/16/87	DOT & TREASURY	MARAD & CUSTOMS	DRAWDOWN OF STRATEGIC PETROLEUM RESERVE	FINN NEILSEN	202-586-4000	
000942	IE	07/26/90	DOT & TREASURY	MARAD & CUSTOMS	WAIVERS OF THE JONES ACT	FINN NEILSEN	202-586-4000	
000225	IG	06/07/82	FBI		INVESTIGATIVE MATTERS	M. T. ABRUZZO	202-586-4143	MOU REMAINS I
000658	IG	10/14/87	OFI		AUDIT COVERAGE OF OFI ACTIVITIES	NANCY ELETT	202-586-4669	
001008	IS		OPM		SERVICES OF OPM INVESTIGATORS	A. BARRY DALINSKY	301-903-5010	PROPOSED MOU
001010	IS		FBI		COORDINATION	DONALD MCINTYRE	202-586-7560	CLASSIFIED
001020	IS		DEA		TECH. SUP. FOR COUNTER-NARCOTIC ACTIVITIES	FRANK ANNECCHINI	202-586-4463	PROPOSED MOU
001021	IS		DOD & TRADE	DoDSI & SE SIG	SECURITY EDUCATION	LYNN GEBROWSKY	301-903-3200	PROPOSED MOU
001039	IS		DOT	FAA	SECURITY INFO EXCHANGE/EXPLOSIVES DET.	CARL POCRATSKY	301-903-2769	PROPOSED MOU
001045	IS		DOT	FAA	EXCHANGE OF SECURITY PROGRAM INFORMATION	CARL POCRATSKY	301-903-2769	PROPOSED MOU

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000235	MI	07/30/82	ATLANTA U. ANL		RESEARCH & EDUCATIONAL PROGRAMS	ISIAH O'SEWELL	202-586-1593	
000824	MI	02/22/90	SHILOH		PRESIDENT'S PARTNERSHIP IN EDUCATION PROG.	LINDA RUDNICK	202-586-1594	
000939	MI	02/22/90	SHILOH		LOAN OF PERSONAL COMPUTER TO SHILOH	MELVA WRAY	202-586-8383	
000208	NE	03/31/88	DOD	AIR FORCE	HEALTH AND SAFETY REVIEW SUPPORT	STEPHAN LANES	301-903-4306	
000237	NE	02/01/85	ADV REACTOR CRP		DOE CIVILIAN REACTOR DEVELOPMENT PROGRAM	SOL ROSEN	301-903-3218	
000238	NE	03/15/82	NRC		SOLID NUCLEAR WASTES	DAN GIESSING	301-903-3456	
000317	NE	06/10/88	EPRI		ADVANCED LWR PROGRAM	DAN GIESSING	301-903-3456	
000598	NE	06/03/88	DOD	USAF/AFIT	SPACE NUCLEAR POWER	ROBERT LANGE	301-903-5338	
000823	NE	07/09/90	NASA		SPACE EXPLORATION INITIATIVE	STEPHEN LANES	301-903-5373	
000831	NE	04/16/90	EPRI & WEC		ADVANCED LIGHT WATER REACTORS	DAN GIESSING	301-903-3456	
000990	NE	08/02/91	EPRI		LWR PLANT LIFETIME IMPROV. RES. PROGRAM	DENNIS HARRISON	301-903-2884	
000994	NE		DOD/NASA	SDIO/AFSC	SPACE NUCLEAR REACTOR POWER SYS. (SP-100)	LYLE RUTGER	301-903-6470	PROPOSED MOU
000996	NE	07/26/91	NASA		RADIOISOTOPE POWER SYS. FOR SPACE MISSIONS	EDWARD MASTAL	301-903-3197	
001028	NE		DOD	ARMY/USATHAMA	HAZARDOUS WASTE	DONNA PHILLIPS	615-576-0395	PROPOSED MOU
001058	NE	05/19/93	USEC		TRANSITION ACTIVITY SUPPORT	ROBERT M. KNIPP	301-903-5841	
001024	NS		DOD & NASA		INTERAGENCY NUCLEAR SAFETY REVIEW PANEL	DAVID PYATT	301-903-5614	PROPOSED MOU
001069	NS		DOD		HEALTH & SAFETY RESPON. FOR DOD REACTORS	AMI SIDPARA	509-372-2155	PROPOSED MOU
000339	NV	01/08/86	DOI	FWS	MANAGEMENT OF AMCHITKA ISLAND, ALASKA	DAVID ROSS	702-295-1209	DE-GM08-86NV1
000340	NV	09/16/85	DOD	AIR FORCE	PERMIT FOR CONTRACTOR ROAD USE	DAVID ROSS	702-295-1209	DE-GM08-87NV1
000341	NV	11/12/85	DOD	AIR FORCE	SAFEGUARD "C" PROGRAM	DAVID ROSS	702-295-1209	DE-GM08-85NV1
000342	NV	01/23/85	DOD	ARMY/USACE	DESIGN AND CONSTRUCTION RELATED SERVICES	DAVID ROSS	702-295-1209	DE-GM08-85NV1
000343	NV	03/09/84	DOI	BUR OF LAND MGMT	FIRE CONTROL AGREEMENT	DAVID ROSS	702-295-1209	DE-GM08-83NNV
000344	NV	06/07/83	DOI	FWS	RADIO REPEATER STATION	KATHY JOHNSON	702-295-0922	DE-GM08-83NV1
000346	NV	07/30/82	DOD	AIR FORCE	CO-USE OF PAHUTE MESA AREA, NTS	DAVID ROSS	702-295-1209	DE-A108-82NV1
000347	NV	10/20/86	DOD	AIR FORCE	TONOPAH TEST RANGE O&M SUPPORT	DAVID ROSS	702-295-1209	DE-A108-86NV1
000349	NV	03/06/81	DOD	AIR FORCE	REMOTE SENSING LAB AND MX-RELATED PROGRAMS	DAVID ROSS	702-295-1209	DE-A108-81NV1
000351	NV	02/03/81	USDA	FOREST SERVICE	LAND USE PERMIT/BLACK HILLS NAT'L FOREST	DAVID ROSS	702-295-1209	DE-A108-81NV1
000354	NV	01/05/79	STATE OF MISS.	STATE BOARD/HEALTH	TATUM DOME PROJECT	MARLENE KOLICIUS	702-295-1080	DE-AC08-79NV1
000355	NV	02/05/75	STATE OF UTAH	BUR OF RAD/OCCUP HLT	RADIOLOGICAL MONITORING	DAVID ROSS	702-295-1209	DE-AC08-76NV0
000356	NV	07/01/74	DOD	AIR FORCE	RADIO FREQUENCY AGREEMENT	DAVID ROSS	702-295-1209	DE-AC08-76DP0
000357	NV	03/28/74	DOD	AIR FORCE	PROJECT ROLLER COASTER MONITORING	DAVID ROSS	702-295-1209	DE-A108-76DP0
000358	NV	04/26/73	USDA	FOREST SERVICE	FIRE SUPPRESSION AGREEMENT	DAVID ROSS	702-295-1209	DE-A108-76DP0
000359	NV	03/14/73	DOD	AIR FORCE	SANDS DEVELOPMENT PROGRAM AT NELLIS AFB	DAVID ROSS	702-295-1209	DE-A108-76NV0
000360	NV	03/14/78	DOD	DEF LOGISTICS AGENCY	INTERAGENCY PERISHABLE SUBSISTANCE SUPPORT	DAVID ROSS	702-295-1209	DE-A108-76NV0

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

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000361	NV	05/25/70	DOD	AIR FORCE	OVERNIGHT PARKING-DOE SECURITY VEHICLES	DAVID ROSS	702-295-1209	DE-A108-76NVO
000362	NV	05/19/69	DOI	BUR OF LAND MGMT	FIRE SUPPRESSION AGREEMENT	NIKKI PLESE	702-295-1160	DE-A108-76NVO
000365	NV	05/10/68	GSA		ADP SHARING EXCHANGE AGREEMENT	DAVIS ROSS	702-295-1209	DE-A108-76NVO
000366	NV	01/12/68	DOD	DEF LOGISTICS AGENCY	PERISHABLE SUBSISTANCE SUPPORT/NTS&PACIFIC	DAVID ROSS	702-295-1209	DE-A108-76NVO
000367	NV	10/20/67	USDA	FOREST SERVICE	RADIOELECTRONICS EQUIPMENT ON CAVE MT	DAVID ROSS	702-295-1209	DE-A108-76NVO
000369	NV	04/15/64	U.S. POSTAL SVC		POSTAL SERVICE AT MERCURY AND AREA 12, NTS	DAIVD ROSS	702-295-1209	DE-A108-76-NV
000371	NV	08/23/73	STATE OF NEVADA	CIVIL DEF/DIS AGENCY	HAZ. MATERIAL ACCIDENT ASSISTANCE PLAN	DAVID ROSS	702-295-1209	DE-AC08-76NVO
000623	NV	08/29/67	DOD	TCDASA	OPERATIONS CONDUCTED AT NTS	DAVID ROSS	702-295-1209	DE-A108-76NVO
000641	NV	06/19/90	DOD	AIR FORCE	NV O&M SUPPORT TO USAF, DET 1, AT NTS	DAVID ROSS	702-295-1209	DE-GM08-90NV1
000659	NV	03/15/89	CAPITOL POLICE		ASSISTANCE OF U.S. CAPITOL POLICE	KATHY JOHANSEN	702-295-0922	DE-GM08-89NV1
000660	NV	01/12/88	DOI	MINISTRY OF HEALTH	177 HEALTH PLAN	DAVID ROSS	702-295-1209	DE-GM08-88NV1
000661	NV	09/11/85	DOD	USAF/TFWC	AMO FACILITY	DAVID ROSS	702-295-1209	DE-GM08-85NV1
000891	NV	08/26/87	DOD	ARMY/BRL	BALLISTIC RANGE FACILITY AT NTS	DAVID ROSS	702-295-1209	DE-GM08-87NV1
000892	NV	06/17/87	DOD	NAVY	USE/CONTROL OF AMCHITKA ISLAND, ALASKA	DAVID ROSS	702-295-1209	DE-GM08-87NV1
000944	NV		DOD	FCDNA	CONTRACTUAL ARRANGEMENTS AT JOHNSON ATOLL	DAVID ROSS	702-295-1209	PROPOSED MOU
000945	NV		NASA		AIR SAMPLING SUPPORT FOR SAFEGUARD "C"	DAVID ROSS	702-295-1209	DE-GM08-91NV1
000999	NV	04/14/92	UNLV		IMPROVING SCIENCE/MATH EDUCATION	MARCELLA GUERRA	702-295-1563	
001030	NV	07/27/92	DRI		IMPROVING SCIENCE/ENG EDUCATION & RESEARCH	MARCELLA GUERRA	702-295-1563	
001043	NV	05/27/92	UNR		IMPROVING SCIENCE/MATH EDUCATION	MARCELLA GUERRA	702-295-1563	
001064	NV	02/22/93	CCSN		IMPROVING SCIENCE/MATH EDUCATION	MARCELLA GUERRA	702-295-1563	
000456	OR	11/17/86	ANDERSON COUNTY		MUTUAL AID BACKUP AMBULANCE SERVICE	KEN LEIFHEIT	615-576-0835	
000457	OR	02/10/89	CTY OF OR, TN	OAK RIDGE POLICE DEP	POLICE DEPT. ASSISTANCE AGAINST THREATS	BILL PHELPS	615-576-0897	
000458	OR	12/13/83	CTY OF OR, TN	OAK RIDGE FIRE DEPT.	MUTUAL AID FIRE PROTECTION AGREEMENT	JIM HUTTON	615-576-0857	
000459	OR	05/26/83	EPA & ST. OF TN		COMPLIANCE AGREEMENT FOR Y-12	B. J. DAVIS	615-576-0846	
000461	OR	03/26/90	ANDERSON CTY TN	SHERIFF'S DEPARTMENT	EMERGENCY RESPONSE	BILL PHELPS	615-576-0897	
000462	OR	02/06/90	ROANE CNTY, TN	SHERIFF'S DEPARTMENT	EMERGENCY RESPONSE	BILL PHELPS	615-576-0897	
000463	OR	02/06/90	STATE OF TN	TN NATIONAL GUARD	EMERGENCY AIR SUPPORT	BILL PHELPS	615-576-0897	
000464	OR	02/27/90	STATE OF TN	TN HIGHWAY PATROL	EMERGENCY RESPONSE	BILL PHELPS	615-576-0897	
000606	OR	09/23/88	U. PUERTO RICO		R & D COOPERATION	LUIS VELAZQUEZ	615-576-0731	
000616	OR	06/09/89	U. OF TN.,ET AL		CONSORTIUM OF RESEARCH INSTITUTIONS	LES PRICE	615-576-0710	
000681	OR	06/21/89	CITY OF OR, TN	POLICE DEPARTMENT	ENFORCEMENT OF TRAFFIC LAWS	PETE DAYTON	615-576-0795	
000682	OR	02/06/90	DOD	ARMY	DISP. OF EXPLOSIVE & INCENDIARY DEVICES	BILL PHELPS	615-576-0897	
001011	PE		DOC/NASA		NATIONAL TECHNOLOGY INITIATIVE	MOLLY GARTNER	202-586-6429	PROPOSED MOU
000223	PR	03/19/82	DOD	DCAA	CONTRACT AUDIT COVERAGE	STEVE MOURNIGHAN	202-586-8182	

MOU LISTING BY CONTROL NUMBER

PREPARED BY HR-63

SOURCE FILE: MOU_CTL#

CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000200	RG	04/20/78	DOJ		CIVIL REGULATORY LITIGATION	MIKE TOBOR	202-586-6727	
000285	RL	04/20/85	STATE OF WASH		RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000286	RL	06/17/82	BENTON/FRANKLIN	COAST GUARD/WPPS	RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000322	RL	03/11/85	WPPSS	HEHF	EMERGENCY RESPONSE AT HANFORD SITE	JUDY TOKARZ	509-376-4766	
000323	RL	12/27/82	WPPSS		RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000324	RL	01/29/85	NWS		EMERGENCY PREPAREDNESS AND PLANNING	JUDY TOKARZ	509-376-4766	
000325	RL	10/01/88	GSA		MISCELLANEOUS SERVICES	SHARYN HILLAND	301-903-5636	
000327	RL	04/07/82	STATE OF WASH	GRANT COUNTY	RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000328	RL	10/01/84	STATE OF WASH	BENTON/FRANKLIN CNTY	RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000331	RL	04/26/85	RICHLAND, ETC.		TRI-CITIES MUTUAL AID AGREEMENT	JERRY DAVIDSON	509-376-4490	
000332	RL	10/08/84	STATE OF WASH	KENNEWICK GEN HOSP	RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000333	RL	10/08/84	STATE OF WASH	KADLEC GEN HOSPITAL	RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000334	RL	10/03/84	STATE OF WASH	OUR LADY/LOURDES HOS	RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000335	RL	02/04/85	INVEST SVC DEPT	WESTINGHOUSE HANFORD	SECURITY COGNIZANCE	LYN MARZETTE	509-376-4420	
000336	RL	02/04/85	INVEST SVC DEPT	PACIFIC NW LABS	SECURITY COGNIZANCE	LYN MARZETTE	509-376-4420	
000685	RL	12/12/85	DOD	NAVY/PSNS	DECOMMISSIONED/DEFUELED SUBMARINE REACTOR	RUDY GUERCIA	509-376-5494	
000686	RL	12/31/84	BENTON/FRANKLIN		EMERGENCY PREPAREDNESS AND PLANNING	JUDY TOKARZ	509-376-4766	
000687	RL	03/20/89	ADVANCED FUELS	HANFORD ENVIR HEALTH	EMERGENCY RESPONSE AT HANFORD	JUDY TOKARZ	509-376-4766	
000688	RL	12/12/86	STATE OF OREGON		RADIOLOGICAL EMERGENCIES	JUDY TOKARZ	509-376-4766	
000689	RL	11/13/87	BENTON SHERIFF		LAW ENFORCEMENT ASSISTANCE PLAN	JIM SPRACKLEN	509-376-6218	
000690	RL	11/13/87	KENNEWICK POLIC		LAW ENFORCEMENT ASSISTANCE PLAN	JIM SPRACKLEN	509-376-6218	
000691	RL	11/13/87	ADAMS CNTY SHER		LAW ENFORCEMENT ASSISTANCE PALN	JIM SPRACKLEN	509-376-6218	
000692	RL	11/13/87	FRANKLIN SHERIF		LAW ENFORCEMENT ASSISTANCE PLAN	JIM SPRACKLEN	509-376-6218	
000693	RL	11/13/87	WASH STATE PATR		LAW ENFORCEMENT ASSISTANCE PLAN	JIM SPRACKLEN	509-376-6218	
000694	RL	11/13/87	GRANT SHERIFF		LAW ENFORCEMENT ASSISTANCE PLAN	JIM SPRACKLEN	509-376-6218	
000695	RL	11/13/87	RICHLAND POLICE		LAW ENFORCEMENT ASSISTANCE PLAN (LEAP)	JIM SPRACKLEN	509-376-6218	
000696	RL	07/25/89	WASH STATE PATR		MUTUAL LAW ENFORCEMENT ASSISTANCE	JIM SPRACKLEN	509-376-6218	
000697	RL	07/10/87	BENTON SHERIFF		MUTUAL LAW ENFORCEMENT ASSISTANCE	JIM SPRACKLEN	509-376-6218	
000698	RL	03/27/86	RICHLAND POLICE		MUTUAL LAW ENFORCEMENT ASSISTANCE	JIM SPRACKLEN	509-376-6218	
000699	RL	09/26/85	KENNEWICK POLIC		MUTUAL LAW ENFORCEMENT ASSISTANCE	JIM SPRACKLEN	509-376-6218	
000700	RL	07/18/84	RICHLAND POLICE		MUTUAL LAW ENFORCEMENT ASSISTANCE	JIM SPRACKLEN	509-376-6218	
001036	RL	09/28/92	DOD	ARMY/USATHAMA	HAZARDOUS WASTE	JOANNE SHADEL	509-376-1231	
000313	RW	11/14/83	NRC		TRANSPORTATION PACKAGING UNDER NWP ACT	CHRIS KOUTS	202-586-9761	
000314	RW	09/16/85	DOT	RSPA	TRANSPORTATION OF RADIOACTIVE MATERIALS	CHRIS KOUTS	202-586-9761	

MOU LISTING BY CONTROL NUMBER

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CNT #	ORG	EFF DATE	P. AGENCY	SUB. AGENCY	TITLE	CONTACT PERSON	PHONE	COMMENTS
000573	RW	12/23/86	DOL	MSHA	MSHA INSPECTION OF RW OPERATIONS	STEVE BROCOUM	202-586-9247	
000604	RW	07/18/88	NRC		PRE-LICENSING COST RECOV-RADIOACTIVE WASTE	CARL CONNER	202-586-4465	
000663	RW	03/01/84	DOI	USGS	USGS EARTH SCIENCE SUPPORT TO DOE	STEVE BROCOUM	202-586-9247	
000830	RW		NRC		LICENSING SUPPORT SYSTEM	LINDA DESELL	202-586-1462	DRAFT MOU
000844	RW	11/29/90	ONWN		SITING OF MRS FAC. OR PERMANENT REPOSITORY	DICK BLANEY	202-586-1252	
000896	RW	09/23/81	NRC		WEST VALLEY DEMONSTRATION PROJECT	LINDA DESELL	202-586-1462	
000570	SAN	04/08/87	DOD	AIR FORCE	ADV. THERMIONIC SPACE NUC. POWER CONCEPT	SCOTT SAMUELSON	415-273-4253	
000318	SEPA	11/16/88	TREASURY	CSN BANK, GA	LOCKBOX DEPOSITORY ARRANGEMENT	SID CLEVELAND	404-283-9911	
000373	SR	04/08/85	SCDHEC		ENVIRONMENTAL QUALITY ON THE SR PLANT	NICKES WILLIAMS	505-239-2497	AMENDED 05/05
000375	SR	01/01/86	GA PWR COMP		PLANNING AND RESPONDING TO EMERGENCIES	JOHN MERRICK	505-239-3928	
000376	SR	07/29/82	DOD	ARMY	EMERGENCY ASSISTANCE	JOHN MERRICK	505-239-3928	REVISED 9/85
000377	SR	06/28/84	GEORGIA DOD	GA EMERG MGMT AGENCY	EMERGENCY RESPONSE	JOHN MERRICK	505-239-3928	AMENDED 02/05
000378	SR	08/22/85	SC/DEPT/HLT/ENV	SC EMERG PREP DIV	EMERGENCY PREPAREDNESS	JOHN MERRICK	505-239-3928	AMENDED 10/05
000379	SR	02/17/59	SC FORESTRY		RADIO FREQUENCY IN DUNBARTON FIRE TOWER	JOHN MERRICK	505-239-3928	
000454	SR	01/10/86	SCDHEC		EMERGENCY PLANNING/PREPAREDNESS & RESPONSE	JOHN MERRICK	505-239-3928	
000638	SR	08/24/90	SOUTH CAROLINA	ACHP	MGMT. OF ARCHAEOLOGICAL SITES ON SR SITE	RONALD D. JERNIGAN	505-239-2685	TO BE REVIEWE
000887	SR	08/23/89	SC LAW ENFORCEM		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	DE-MU90SR1833
000888	SR	11/09/89	ALLENDALE SHERI		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000909	SR	10/29/87	SCWMRD		UTILIZATION OF CRACKERNECK AREA OF SRP	RONALD D. JERNIGAN	505-239-2685	
000910	SR	10/28/80	STATE OF SC		SHIPMENTS OF RADIOACTIVE WASTE	NICKS WILLIAMS	505-239-2497	
000911	SR	01/09/86	GSA	OIRM	ADP RISK ANALYSIS/SEC. AUDITS SUP. SERV.	RICK ENDLER	505-239-5609	
000912	SR	04/04/89	US GEOLO SURVEY		DATA COLLECTION AND ANALYSIS	DENNIS RYAN	505-239-3957	
000913	SR	03/21/90	ST. OF GEORGIA	DEPT OF PUB. SAFETY	SECURITY SUPPORT	K. H. BESECKER	505-239-3084	
000914	SR	12/12/89	GEORGIA BOI		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000915	SR	11/27/89	SCWMRD		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000916	SR	06/11/76	AIKEN COUNTY		OFFSIGHT COMMUNICATIONS CENTER	JOHN MERRICK	505-239-3928	
000917	SR	05/21/90	SAVANNAH POLICE		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000918	SR	02/02/90	AUGUST DEPT PS		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000919	SR	09/07/89	AUGUSTA POLICE		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000920	SR	08/25/90	BARNWELL SHERIF		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000921	SR	09/07/89	JACKSON POLICE		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000922	SR	09/01/89	AIKEN SHERIFF'S		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000923	SR	09/22/89	NEW ELLENTON PO		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	
000924	SR	09/07/89	RICHMOND SHERIF		SECURITY SUPPORT	K. H. BESECKER	505-239-2190	

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000925	SR	08/24/89	SCHP	LAW ENFORCEMENT DIV.	SECURITY SUPPORT	K. H. BESECKER	505-239-2190	MOUS DE-MU09-
001027	ST	07/09/92	NASA		ENERGY-RELATED CIVIL SPACE ACTIVITIES	FENTON CAREY	202-586-7008	
001048	ST	10/15/92	EPA		TECH TRANSFER/UTIL./COMMERCIALIZATION	ROGER LEWIS	202-586-6864	
001049	ST	10/16/92	CAL/EPA		TECH RES/DEV/TRANS/UTIL/COMMERCIALIZATION	ROGER LEWIS	202-586-6864	
000288	SWPA	08/09/66	DOD	ARMY/USACE	TRANSMISSION & SWITCHING FACILITIES	JAMES MCCLANAHAN	918-581-7429	
000289	SWPA	10/04/78	DOD	ARMY/USACE	SOUTHWEST FEDERAL POWER SYSTEM	JAMES MCCLANAHAN	918-581-7429	
000290	SWPA	07/23/80	DOD	ARMY/USACE	PROJECTS, DATA DISSEMINATION, AND LAND USE	FRANCIS GAJAN	918-581-7529	
000291	SWPA	01/21/64	DOI		INTERCHANGE OF POWER AND ENERGY	FRANCIS CAJAN	918-581-7529	
000292	SWPA	09/02/70	USDA		MAINTENANCE OF EASEMENT	LINDA MUMMEY	918-581-7534	
000293	SWPA	06/15/85	DOD	ARMY/USACE	MICROWAVE APPLICATION AT COE PROJECTS	DAN JOHNSON	918-581-7504	
000855	SWPA	06/14/90	DOD		ELECTRICAL SERVICE SYSTEMS	FRANCIS GAJAN	918-581-7529	
000856	SWPA	03/19/90	DOJ	FBI	USE OF SW & FBI COMMUNICATION FACILITIES	DAN JOHNSON	918-581-7504	
000857	SWPA	05/08/90	GSA	BENTLEY HEDGES	PAYMENT TO BENTLEY HEDGES	GARY SWARTZLANDER	918-581-7491	
000858	SWPA	03/22/89	DOT	NCNB TEXAS NAT. BANK	LOCKBOX DEPOSITORY AGREEMENT	GARY HAYTER	918-581-7493	
000859	WAPA	11/01/79	DOI/DOD/DOC/DA	BOR & GS/USACE/NOAD	COLORADO RIVER SYS. STREAMFLOW FORECASTING	SANDEE ROTH	303-231-7961	
000860	WAPA	01/21/88	DOI, ET AL.		RECOV. IMPL. PROG. FOR ENDANGERED SPECIES	SANDEE ROTH	303-231-7961	APPLIES ONLY
000861	WAPA	05/02/90	NAVAJO NATION		TRANSMISSION CAPACITY/FACILITIES	SANDEE ROTH	303-231-7961	
000862	WAPA	03/26/80	DOI		FED. POWER SYSTEM AGENCY RESPONSIBILITIES	SANDEE ROTH	303-231-7961	
000863	WAPA	11/25/86	DOI	BUR OF LAND MGMT	FAC. ASSOC. WITH ELECTRICITY TRANSMISSION	SANDEE ROTH	303-231-7961	MOU APPLIES T
000864	WAPA	11/25/83	DOA	FOREST SERVICE	NATIONAL FOREST SYSTEM LANDS	SANDEE ROTH	303-231-7961	
000865	WAPA	08/26/83	DOI	BUR OF RECLAMATION	COLORADO RIVER STORAGE PROJECT AGREEMENT	SANDEE ROTH	303-231-7961	AGREEMENT RES
000866	WAPA	05/31/88	DOI	BUR OF RECLAMATION	PRINCIPLES FOR A JOINT OPERATION CENTER	SANDEE ROTH	303-231-7961	LOCATED AT WA
000867	WAPA	04/05/89	RED ROCK COMMUN		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000868	WAPA	08/05/90	DENVER UNIVERSI		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000869	WAPA	07/27/90	METRO STATE COL		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000870	WAPA	09/29/88	NEVADA UNIVERSI		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000871	WAPA	08/24/89	GLEND COMMU COL		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000872	WAPA	07/09/90	BISMARCK ST COL		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000873	WAPA	06/04/90	MILES CITY COMM		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000874	WAPA	07/10/90	LITTLE BIG HORN		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000875	WAPA	07/05/90	BLACKFEET COMMU		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000876	WAPA	05/11/90	ROCKY MOUNTAIN		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000877	WAPA	06/04/90	EASTERN MONTANA		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000878	WAPA	07/23/81	CALI POLYTECHNI		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	

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000879	WAPA	04/25/90	MESA STATE COLL		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000880	WAPA	02/27/90	BOISE STATE UN		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000881	WAPA	03/20/81	CALI STATE UNIV		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000882	WAPA	05/25/82	CALI UNIV SACRA		COOP EDUCATION PROGRAM WORKING AGREEMENT	SANDEE ROTH	303-231-7961	
000952	WAPA	05/21/87	DOD		ELECTRICAL SERVICE	SANDEE ROTH	303-231-7961	
001038	WAPA		DOI	BUR OF LAND MGMT	PUBLIC LAND ELECTRICITY TRANSMISSION	SANDEE ROTH	303-231-7961	PROPOSED MOU

MEMORANDUM OF UNDERSTANDING

BETWEEN
DEPARTMENT OF ENERGY
AND
DEPARTMENT OF HEALTH AND HUMAN SERVICES

FOR

ELECTRIC AND MAGNETIC FIELDS RESEARCH
AND
PUBLIC INFORMATION DISSEMINATION

I. INTRODUCTION

A. Background

There has been growing public concern that exposure to electric and magnetic fields produced by the distribution and use of electric power may be linked to certain illnesses. Currently available scientific data are inadequate to determine whether electric and magnetic fields are a health hazard.

Section 2118 of the Energy Policy Act of 1992, Pub. L. No. 102-486 authorizes an Electric and Magnetic Fields Research and Public Information Dissemination Program. It also provides for the establishment of an Interagency Committee to develop a research agenda and to assist in the coordination of Federal activities and an Advisory Committee to provide recommendations on the design and implementation of the program.

B. Purpose

This Memorandum of Understanding establishes the guidelines and procedures under which the Department of Energy and the Department of Health and Human Services will cooperate in the implementation of section 2118 of the Energy Policy Act.

C. Authority

This Memorandum of Understanding fulfills a requirement of section 2118 of the Energy Policy Act of 1992, Pub. L. No. 102-486.

II. RESPONSIBILITIES

A. Department of Health and Human Services

Under the program authorized by section 2118 of the Energy Policy Act, the Secretary of Health and Human Services, acting through the Director of the National Institute of Environmental Health Sciences, has sole responsibility for biomedical research on possible human health effects of exposure to electric and magnetic fields. The Director of the National Institute of Environmental Health Sciences may delegate this responsibility to the extent the Director determines appropriate. The Director of the Institute will collect, compile, publish, and disseminate scientifically valid information on possible human health effects of exposure to electric and magnetic fields.

In addition to research conducted by the National Institute of Environmental Health Sciences, the Institute in consultation with the Interagency Committee and the Advisory Committee, will solicit and support grants and contracts to conduct activities under the program. All biomedical research proposals funded under appropriations for section 2118 of the Energy Policy Act must be submitted to, and evaluated by, at least one scientific and technical peer review panel prior to selection.

The Department of Health and Human Services may perform biomedical research on possible health effects associated with exposure to electric and magnetic fields and carry out public information dissemination activities, in addition to work funded by appropriations for section 2118 of the Energy Policy Act and the associated non-Federal contributions. The National Institute of Environmental Health Sciences will establish a mechanism to assure that such research is consistent with the coordination guidelines that are developed by the Interagency Committee.

B. Department of Energy

The Secretary of Energy has responsibility for the research, development, and demonstration of technologies to improve the measurement and characterization of electric and magnetic fields and to assess and manage exposures to electric and magnetic fields. The Secretary of Energy, consistent with guidelines for coordination established by the Interagency Committee, will collect, compile, publish, and disseminate scientifically valid information on the types and extent of human exposures to electric and magnetic fields in various occupational and residential settings, technologies to measure and characterize electric and magnetic fields, and methods to assess and manage exposure to electric and magnetic fields.

The Department of Energy, in consultation with the Interagency Committee and the Advisory Committee, will solicit and select proposals to conduct activities under the program. Proposals funded under appropriations for section 2118 of the Energy Policy Act must be submitted to, and evaluated by, at least one scientific and technical peer review panel prior to selection.

The Department of Energy may perform research on possible biological effects associated with exposure to electric and magnetic fields with funds appropriated under authorities other than section 2118 of the Energy Policy Act. The Department of Energy will also be responsible for the administration of any health effects research under section 2118 delegated to it by the National Institute of Environmental Health Sciences. The Department of Energy will work closely with the Institute to assure that the respective research programs are appropriately coordinated. These coordination activities may include joint site visits, reciprocal participation in the peer review processes, and cooperative program planning.

III. PROGRAM GUIDELINES

A. Electric and Magnetic Fields Interagency Committee

The Interagency Committee is responsible for the development of a comprehensive electric and magnetic fields research agenda. This committee is composed of a single representative from each of nine Federal agencies specified in section 2118 (d)(2)(A) of the Energy Policy Act, including a representative from the Department of Energy and a representative from the National Institute of Environmental Health Sciences. The committee recommends guidelines for coordinating Federal research on possible health effects of exposure to electric and magnetic fields and related engineering research and communicating these results to the public. This committee monitors, reviews, and periodically evaluates the program. The Interagency Committee, in consultation with the Advisory Committee, is required to submit to the Secretary of Energy and to Congress a report summarizing the progress of the research program by December 31, 1995. A final report stating the committee's findings and conclusions on the effects, if any, of exposure to electric and magnetic fields on human health and on needed remedial actions, if any, will be submitted to the Secretary of Energy and to Congress by September 30, 1997.

B. National Electric and Magnetic Fields Advisory Committee

The Advisory Committee provides recommendations to the Interagency Committee and advises the Department of Energy and the National Institute of Environmental Health Sciences on the design and implementation of the program, including the preparation of solicitations for proposals to conduct research on the possible health effects of exposure to electric and magnetic fields.

C. The National Academy of Sciences

Any person who conducts activities under the program will submit to the National Academy of Sciences, the Interagency Committee, and the Advisory Committee a report summarizing completed activities and results. The National Academy of Sciences will evaluate research activities under the program and periodically submit a report of that evaluation to the Interagency Committee and the Advisory Committee.

IV. PROGRAM FUNDING

Within 30 days of enactment of appropriations, the Department of Energy will notify the National Institute of Environmental Health Sciences of the amount of funding appropriated pursuant to section 2118 of the Energy Policy Act. The annual level of financial support to be transferred to the National Institute of Environmental Health Sciences by the Department of Energy under the program authorized by section 2118 of the Energy Policy Act will be specified in interagency agreements, subject to both appropriations and receipt of required non-Federal private contributions. This Memorandum of Understanding shall not be used to obligate or commit funds or as the basis for the transfer of funds. The Department of Energy will consider the authorization level contained in section 2118 in the development of its annual budget request. The Department of Energy and the National Institute of Environmental Health Sciences will provide mutual support in budget justification to the Office of Management and Budget and in hearings before Congress with respect to collaborative research on possible health effects of exposure to electric and magnetic fields and public information dissemination programs. The Secretary of Energy will solicit contributions from non-Federal sources to offset at least 50 percent of the funding of all activities under the program. These contributions will be used in the same manner as appropriated funds for this program. Both the Department of Energy and the National Institute of Environmental Health Sciences may provide financial assistance and enter into contracts to conduct program activities.

V. PATENTS AND TECHNICAL DATA

Appropriate patent and other intellectual property provisions shall be included in interagency agreements and any other agreements entered into by the parties in order to implement this Memorandum of Understanding. Department of Energy patent and intellectual property policies shall apply to any such work performed by a contractor (including any subcontractor) which is funded in whole or in part by the Department of Energy. Rights to inventions made by United States Government employees shall be determined by the employing agency.

VI. PUBLIC INFORMATION DISCLOSURE

Information concerning research results will be disseminated to the public. Subject to the Freedom of Information Act (5 U.S.C. 552), decisions on the disclosure of information to the public regarding projects and programs referenced in the Memorandum of Understanding shall be made by the Department of Energy following consultation with the Department of Health and Human Services.

VII. EFFECTIVE DATE, AMENDMENT, AND TERMINATION

This Memorandum of Understanding shall become effective upon the latter date of signature of the Secretary of Energy and the Secretary of Health and Human Services. It may be amended by written agreement between the Department of Energy and the Department of Health and Human Services.

This Memorandum of Understanding may be terminated by either party upon 60-day notice, and in any event shall terminate on December 31, 1997, the specific expiration date for the Electric and Magnetic Fields Research and Public Information Dissemination Program authority under section 2118 of the Energy Policy Act.

DEPARTMENT OF ENERGY	DEPARTMENT OF HEALTH AND HUMAN SERVICES
Hazel R O'Leary	
By: Hazel R. O'Leary Secretary	By: Donna E. Shalala Secretary
Date: January 13, 1994	Date: ________________

MEMORANDUM OF UNDERSTANDING BETWEEN THE DEPARTMENT OF ENERGY AND THE ENVIRONMENTAL PROTECTION AGENCY ESTABLISHING A FRAMEWORK FOR COOPERATION FOR PREPARING THE NUCLEAR WEAPONS COMPLEX PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

The purpose of this Memorandum of Understanding (MOU) is to establish a framework to facilitate the interaction between the Department of Energy (DOE) and the Environmental Protection Agency (EPA) in preparing the Nuclear Weapons Programmatic Environmental Impact Statement (PEIS).

The Nuclear Weapons Complex (Complex) is a set of interrelated facilities under the control of DOE that design, manufacture, test, and maintain nuclear weapons in this country's arsenal and dismantle the weapons retired from that stockpile. Many of the current Complex facilities were constructed more than thirty years ago and are now in need of major repairs and renovation to address safety and environmental protection concerns. At the same time, recent downsizing of the nuclear weapons stockpile has resulted in excess capacity, the maintenance of which is a large and unnecessary cost. In response to these issues, DOE has developed a proposal to reconfigure the Complex, known as Complex 21. Complex 21 would be fully operational early in the 21st century and would sustain the nation's nuclear deterrent until the middle of that century.

DOE is currently preparing a PEIS, pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended, to assist DOE in the decisionmaking process regarding long-range planning for the Complex. NEPA allows those agencies with a special expertise in an environmental analysis area to assist another agency in the preparation of an environmental impact analysis by being a cooperating agency. In accordance with the terms of NEPA, early on in the NEPA process, DOE asked other federal agencies which might have an interest in the weapons complex, if they would like to identify themselves as a cooperating agency. EPA has elected to so identify itself and to assist DOE as a cooperating agency in the preparation of the Nuclear Weapons Complex PEIS. This MOU establishes the basis for an understanding of the roles and responsibilities between DOE and EPA in the preparation of the Draft and Final Nuclear Weapons Complex PEIS. Funds and resources will not be transferred between DOE and EPA as a result of this MOU.

DOE is the lead agency for this action, pursuant to the provisions of 40 CFR 1508.16, and as such, has responsibility for compliance with the requirements for NEPA and the preparation of the Draft and Final PEIS and the Record of Decision (ROD). As the lead agency DOE agrees:

1) to provide EPA with the preliminary draft and preliminary final PEIS documents in sufficient time to enable EPA to conduct a thorough review and prepare comments on these documents prior to publication;

2) to make available to EPA, all baseline studies, methodologies and supporting information for the specific technical areas in which DOE requests EPA review and comments;

3) to hold meetings and conduct technical briefing sessions, as requested by EPA, on any areas in which EPA requires additional information or clarification in order to enable EPA to provide meaningful review of the specific areas requested by DOE;

4) to accommodate the comments provided by EPA to the maximum extent possible consistent with DOE's responsibilities as lead agency;

5) to note on the draft and final PEIS cover page that EPA is a cooperating agency, as defined in 40 CFR 1501.6, and include in the introductory sections of both of these documents a statement that briefly describes EPA's role as a cooperating agency, under the terms of NEPA, and EPA's authorities under NEPA and Section 309 of the Clean Air Act to review and comment on the PEIS.

EPA, as a cooperating agency, pursuant to the provisions of 40 CFR 1501.6, agrees:

1) to assist DOE in defining issues and concerns to be addressed in the PEIS;

2) to provide information in those areas where EPA has regulatory and/or technical expertise, including NEPA implementation, risk assessment, risk management, and fate and transport modeling; and

3) to review and provide comments, in a timely manner, on those specific technical areas requested by DOE and upon the preliminary draft and preliminary final PEIS.

This MOU shall be effective upon signature by both EPA and DOE. It can be modified only by mutual agreement of DOE and EPA and will terminate when the NEPA process has been completed for the Nuclear Weapons Complex PEIS or upon written notice from either DOE or EPA. Any modification to this MOU will be in writing.

This MOU pertains only to EPA's participation as a cooperating agency providing technical expertise in specific areas to assist DOE in the preparation of the Nuclear Weapons Complex PEIS. This

MOU in no way implies or extends to EPA an oversight role over the management of mission assignments within the DOE complex. This MOU in no way abrogates, alters or in any way modifies existing or future environmental compliance or cleanup agreements, other enforceable agreements, any permitting or other regulatory requirements, or any enforcement actions. This MOU in no way alters EPA's responsibilities under NEPA and Section 309 of the Clean Air Act to provide scoping comments and conduct an official review of the draft and final PEIS. Furthermore, this MOU will not be utilized to affect any state actions or policies with respect to specific DOE sites.

This MOU establishes the following agency points of contacts for issues pertaining to the development of the Nuclear Weapons Complex PEIS:

DOE

Carol Borgstrom
Director
Office of NEPA Oversight (EH-25)
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

EPA

Richard E. Sanderson
Director, Office of Federal Activities
Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460
Telephone: (202) 260-5053

Linda G. Stuntz

Linda G. Stuntz
Deputy Secretary
Department of Energy

January 19, 1993
Date

F. Henry Habicht II
Deputy Administrator
Environmental Protection Agency

DEC 21 1992
Date

MEMORANDUM OF UNDERSTANDING

between

THE UNITED STATES DEPARTMENT OF ENERGY

and

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

on

GENERAL COOPERATION

I. OBJECTIVE

The Department of Energy (DOE) and the Environmental Protection Agency (EPA) commit to work together to help U.S. industrial activities, waste disposal, and energy production and use become more efficient and environmentally sound. A cooperative approach to mutual objectives by the Department of Energy and the Environmental Protection Agency can increase program effectiveness and support broad-based cooperation with State and local governments, colleges and universities, and industry. Each agency envisions the benefit of working together on the following (non-exclusive) areas:

- Efficiency and conservation in energy production, conversion, and use in the federal government, industry, the utility, commercial, and residential sectors, and transportation;
- Pollution prevention;
- Technology transfer, commercialization, utilization, and trade opportunities;
- Interactions with small and disadvantaged business;
- Development of environmentally sound manufacturing processes;
- Integrating economic growth and industrial competitiveness with environmental protection;
- Decommissioning and decontamination of facilities;
- Technology for site remediation, and waste treatment and minimization;

- Joint use, where appropriate, of research, development and demonstration facilities, including those specially permitted for specific environmental activities, operated by or for each agency;
- Recycling, recovery and reuse;
- Regional, state, and local partnerships, including those related to energy, environmental restoration, or waste management initiatives;
- Education and outreach.

a. The objective of this Memorandum of Understanding (MOU) is to maximize each agency's efforts in areas of mutual interest and to use administrative methods that will facilitate cooperation and coordination between the United States Department of Energy (DOE) and the United States Environmental Protection Agency (EPA) in all mutually-agreed activities. This cooperation and coordination will not only be between the two agencies but also may include joint initiatives with non-federal entities, including State and local governments, colleges and universities, and industry.

Specific Interagency Agreements (IAGs) and Memoranda of Understanding between EPA and DOE and their component units are being, and will continue to be, developed pursuant to this MOU to define specific undertakings. Such agreements may provide for the use of facilities, personnel, cooperative projects, and transfer of funds, and shall comply with the laws, regulations, and orders pertaining to the respective agencies. The details of the levels of support to be furnished one agency by the other with respect to funding will be developed in specific interagency agreements or other agreements, subject to the availability of funds. This MOU will not be used to obligate or commit funds or as the basis for the transfer of funds.

II. AUTHORITIES

Nothing in this agreement alters the statutory authorities of the Environmental Protection Agency or the Department of Energy. This agreement is intended to facilitate the fulfillment of statutory requirements and cooperative efforts, including mandates for consultation on policy matters, the mutual provision of research and technical assistance by both agencies, and the conduct of programs affecting the quality of the environment and addressing a wide range of research and development needs of the nation.

The Environmental Protection Agency has regulatory responsibility for the prevention, control, and abatement of pollution in areas of air, water, soils, solid waste, pesticides, noise, radiation, and toxic substances. This includes setting and enforcing environmental standards; conducting research on the causes, effects, and control of environmental problems; and assisting state and local entities in the implementation of specific environmental programs.

The Department of Energy has statutory responsibility for developing and carrying out comprehensive energy strategies, plans, and programs aimed at promoting conservation, energy efficiency, and ensuring the performance of research and development related to fossil, nuclear, and alternative energy production and use, environmental, national defense, and basic and applied science requirements. The Department has both environmental responsibilities for its own sites and the capability to apply its efforts concurrently to other environmental initiatives that support shared technical and regulatory objectives.

The agencies share an interest in encouraging responsible and efficient management and development of the nation's energy systems in an economically efficient and environmentally sound manner. The actions carried out under this agreement will strengthen coordination, increase understanding and facilitate action on issues concerning energy and the environment, and reduce the duplicative use of resources and expertise.

III. PROVISIONS

The Department of Energy agrees:

To provide expertise on energy production and use and other mission-related issues by providing the Environmental Protection Agency with technical reviews, advice, consultation, and technical assistance in the planning and reviewing of national programs, training, research, and demonstrations;

To establish processes which encourage, guide, and facilitate the Environmental Protection Agency's working arrangements with the Department of Energy, its regional offices, research laboratories, and cooperating entities;

To cooperate and consult on programs and activities conducted or supported by the Environmental Protection Agency and its cooperating entities toward improving the quality of the nation's environment and improving the effectiveness of the nation's research efforts in energy and environmental technologies and related science.

The Environmental Protection Agency agrees:

To provide expertise on environment and related issues by providing the Department of Energy with technical reviews, advice, consultation, and technical assistance in the planning and review of national programs, training, research, and demonstrations;

To establish processes which encourage, guide, and facilitate the Department of Energy's working arrangements with the Environmental Protection Agency, its regional offices, research laboratories, and cooperating entities;

To cooperate and consult on programs and activities conducted or supported by the Department of Energy, especially as these efforts contribute to the quality of the nation's environment and improving the effectiveness of the nation's research efforts in energy and environmental technologies and related science.

It is mutually agreed:

To exchange, as appropriate, personnel, equipment, data, materials and to provide reasonable access to each agency's facilities to accomplish tasks of mutual interest and develop detailed plans for future joint activities;

To efficiently share the mechanisms and expertise of the each agency and to jointly develop additional tools and mechanisms as may be appropriate;

That appropriate patent and other intellectual property provisions shall be included in interagency agreements and any other agreements entered into by the parties in order to implement this MOU. Rights to inventions made by the United States Government employees shall be determined by the employing agency.

That, subject to the Freedom of Information Act (5 U. S. C. 552), each agency shall routinely consult with each other prior to making decisions on disclosure of information to the public regarding projects and programs referenced in this MOU.

That DOE and EPA will provide each other mutual support in budget justification to the Office of Management and Budget and hearings before the Congress with respect to programs on which the organizations collaborate.

To establish primary points of contact within each agency, to regularly review cooperative activities, and convene an ongoing forum for the discussion of issues affecting each agency. Additional, independent points-of-contact for each agency will be identified in every Memorandum of Understanding or Interagency Agreement established under this general MOU and these individuals will keep the points-of-contact established in this MOU apprised of significant cooperative developments.

IV. POINTS OF CONTACT

The points of contact for this Memorandum of Understanding on General Cooperation are:

Department of Energy
Associate Deputy Under Secretary for Program Analysis
Domestic and International Energy policy

Environmental Protection Agency
Deputy Assistant Administrator for Policy, Planning, and Evaluation

V. DURATION OF THE AGREEMENT

This memorandum of understanding may be amended by written agreement between DOE and EPA. This agreement becomes effective on the date of signature by both parties. It shall remain in effect for a 5-year term from the effective date. This MOU may be terminated by the mutual written agreement of DOE and EPA or by either party upon 90 day notice to the other party.

James D. Watkins
Admiral, U. S. Navy (Retired)
Secretary of Energy
U. S. Department of Energy

Date: October 15, 1992

William K. Reilly
Administrator
U. S. Environmental Protection Agency

Date: October 15, 1992

MEMORANDUM OF UNDERSTANDING
AMONG THE
U.S. DEPARTMENT OF DEFENSE,
U.S. DEPARTMENT OF INTERIOR,
U.S. DEPARTMENT OF ENERGY,
U.S. ENVIRONMENTAL PROTECTION AGENCY, AND
THE WESTERN GOVERNORS' ASSOCIATION
REGARDING ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT

I. Purpose

The purpose of this Memorandum of Understanding (MOU) is to establish a more cooperative approach to development of technical solutions to environmental restoration and waste management problems shared by States, commercial entities, and the Federal government. The regional approach will serve as a demonstration of principles and practices which may be adopted nationally.

II. Objective

To encourage cooperation among the U.S. Department of Defense (DOD), U.S. Department of the Interior (DOI), U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), and the Western Governors' Association (WGA) in research, development, and demonstration (RD&D) of cost effective waste management technologies germane to Federal lands and facilities in western states and insular areas, and associated information exchange related to waste management.

III. Background

Hazardous and radioactive waste sites pose unique management, treatment, and disposal problems that must be addressed to ensure protection of public health, welfare, and environment.

The Nation's waste clean-up effort will last at least a generation; its costs promise to be unprecedented. Various complex waste management and environmental restoration problems exist in the West. The signatories to this agreement are committed to a long-term, cost-effective effort to: clean up and restore contaminated Federal lands and sites in Western States; safely dispose of the associated waste; develop methods of minimizing or avoiding the generation of future waste; and share information relating to emerging waste technologies. Cooperative strategies for research, development, and demonstration are required to promote development of new technologies and to assess their effectiveness so that they may be permitted and implemented.

Selection of projects for State and Federal waste management research and development funding should be based on wide competition and broad participation. Wider competition and broader participation among technologies and participants will encourage more responsive and rapid deployment of waste management technologies. It will also promote more rapid commercialization yielding further benefits to the region and the nation.

The signatories seek a regionally integrated cooperative approach to identifying solutions to problems. The proposed approach for this MOU will bring together the signatories or their designated representatives to share information on emerging waste management technologies and describe needs for new technologies so that scarce RD&D funds are targeted to the right problems at Federal lands and sites to the extent permitted by law.

The signatories are committed to fostering the development of better, faster, safer and more cost effective site restoration and waste management technologies and methods.

IV. Authorities

Nothing in this MOU alters the responsibilities or statutory authorities of DOD, DOI, DOE, EPA, WGA, or individual States and insular areas. This MOU does not supersede existing agreements among any of the signatories.

V. Responsibilities

The signatories agree to prepare an annual report to identify and list by priority regional waste management RD&D needs on federal lands and facilities and assess existing commercial capabilities and technology development initiatives. The report will include an identification and assessment of emerging Federal waste management and cleanup technologies, regulatory issues related to implementation, and the effectiveness of technology selection processes. The report will highlight current funding levels and the most pressing waste management problems at Federal sites and identify for demonstration the most promising new solutions.

The report will be completed and submitted to the signatories no later than February of each year for use as a resource in the formulation of the nation's waste cleanup effort.

The signatories agree that this MOU is intended to be a prelude to a National program for identifying and implementing needed new, effective, cost effective technologies for development and deployment.

VI. Authentication

This MOU becomes effective upon its signature by all parties. The MOU will continue in effect for five (5) years or until modified by mutual consent. Participation by any signatory member may be terminated at the request of any signatory within ninety (90) days prior notice.

Colin McMillan 7/22/91

Assis. Secretary of Defense — Date

Secretary of Interior — Date

7/22/91

Secretary of Energy — Date

7/22/91

Administrator of Environmental Protection Agency — Date

7/22/91

Chairman of the Western Governors' Association — Date

7/22/91

Vice Chairman of the Western Governors' Association — Date

QUESTIONS FROM REPRESENTATIVE ROHRABACHER

Question 29(a) Please document the savings of more than a billion dollars through the renegotiation of the Hanford agreement.

Answer: The U.S. Department of Energy, the U.S. Environmental Protection Agency (EPA), and the Washington Department of Ecology (Ecology) signed the Cost and Management Efficiency Initiative (CEI) in January 1994, in conjunction with the renegotiation of the Tri-Party Agreement (TPA) that governs the cleanup work underway at the Hanford Site in southeastern Washington State. This sub-agreement to the TPA commits the three partners to achieve savings of $1 billion in cleanup costs at Hanford from Fiscal Year (FY) 1994 through FY 1998. These cost savings are intended to be reapplied to other cleanup efforts at the Hanford Site. Success indicators will include schedule acceleration, regulatory reductions, and economic transition.

The focus of Hanford's CEI activities is in the areas of site-wide reengineering and reinvention activities ranging from process improvement efforts and value engineering studies, to privatization and outsourcing initiatives. The CEI is a grass roots effort to involve all types of "process owners" in developing and implementing process improvements or cost savings within their areas of responsibility.

Three tiers of performance improvement initiatives are documented in the Department's "Cost and Management Efficiency Initiative $1 Billion Cost Savings Plan" (attached). This plan was developed in October of 1994 by the Richland Operations Office, Office of Economic and Strategic Transition and Integration in support of CEI activities. These tiers are distinguished below:

Tier 1 - Reengineering initiatives that deal with key mission processes, or "value chains", of the overall Hanford enterprise.

Tier 2 - Process improvements directed by management that cross-cut functional organizations of either an individual contractor, the DOE, or several contractors and the DOE.

Tier 3 - Functional Improvements initiated at the "grass roots" level by individuals within a particular contractor and/or DOE organization.

Cost saving goals by fiscal year and tier are tabulated below. A cumulative savings of $1 billion is planned. Progress towards meeting the savings goal will be measured against the baseline as defined in the CEI.

Cost Savings Goals ($ in Millions)

	FY-94	FY-95	FY-96	FY-97	FY-98	CUM.
TIER 1	40	60	60	70	70	300
TIER 2	50	80	80	90	100	400
TIER 3	40	60	60	70	70	300
TOTALS	130	200	200	230	240	1000

A monthly report (as of February 1995 is attached) is generated by a recently developed RL Baseline Scorecard System identifying cost savings by Work Breakdown Structure (WBS) number and fiscal year. The report includes cost savings identified in FY 1994 through FY 1998. As of February 1995, the report included a total cost savings of $587.8M out of the planned $1 billion savings.

Cost and Management Efficiency Initiative
$1 Billion Cost Savings Plan

Prepared by:

Department of Energy
Richland Operations Office
Office of Economic and Strategic
Transition and Integration

Cost and Management Efficiency Initiative
$1 Billion Cost Savings Plan

Approvals

Joe W. Wiley 9/29/94

J. W. Wiley, Director — Date
Strategic Transition Initiatives Division

LC Williams 10/7/94

L. C. Williams, Director — Date
Office of Economic and Strategic
Transition and Integration

Contents

1.0 Introduction 1

2.0 Roles and Responsibilities 2
  2.1 Department of Energy, Richland Operations Office 3
    2.1.1 Office of Economic and Strategic Transition and Integration 3
    2.1.2 Strategic Transition Initiatives Division 3
    2.1.3 Upper Management Planning 3
  2.2 Hanford Site Contractors 4
  2.3 Process Owner 4

3.0 Approach 5
  3.1 Types of Initiatives 5
  3.2 Identification of Improvement Targets 5
    3.2.1 Front-End Analysis 6
    3.2.2 Selection Criteria 6

4.0 Cost Savings Schedule, Tracking, and Validation 7
  4.1 Cost Savings Schedule 7
  4.2 Baseline and Validation 7
    4.2.1 Cost Baseline 7
    4.2.2 Cost Reductions 8
    4.2.3 Cost Avoidance 8
    4.2.4 Productivity Commitment 8

5.0 Initiatives 9
  5.1 Department of Energy, Richland Operations Office 9
  5.2 Hanford Site Contractors 9
    5.2.1 Westinghouse Hanford Company 9
    5.2.2 Pacific Northwest Laboratory 10

6.0 Site and Area Impacts 12

Figure 1. Organizational Roles 2

Table 1. Cost Savings Goals 7

1.0 Introduction

The United States Department of Energy, Richland Operations Office (RL), the United States Environmental Protection Agency (EPA), and the Washington Department of Ecology (Ecology) signed the Cost and Management Efficiency Initiative (CEI) in January 1994. This subagreement to the Tri-Party Agreement commits the three partners to achieve savings of $1 billion in the cleanup costs at Hanford from Fiscal Year (FY) 1994 through FY 1998. Within the limits created by a productivity commitment (see 4.2.4), these cost savings will be reapplied to other cleanup efforts at the Hanford Site. Success indicators will include schedule acceleration, regulatory reductions, and economic transition.

The CEI tasked RL to prepare a plan and schedule for achieving the $1 billion savings. Accordingly, this plan provides the following:

- a description of the methodology and approach for achieving the $1 billion savings goal
- the roles and responsibilities of the various organizations involved in the effort
- the basis from which savings will be measured
- a discussion of the various tools, techniques, and methods the site will use to achieve its goal of becoming more cost efficient
- the overall savings schedule and, in general, where the site's efforts will be focused in meeting the savings goal.

Cost savings will be reviewed on a periodic basis, at least annually, and this plan will be revised as needed to achieve the required savings goal.

2.0 Roles and Responsibilities

This section describes the roles and responsibilities of the key organizations involved in reaching the $1 billion savings goal.

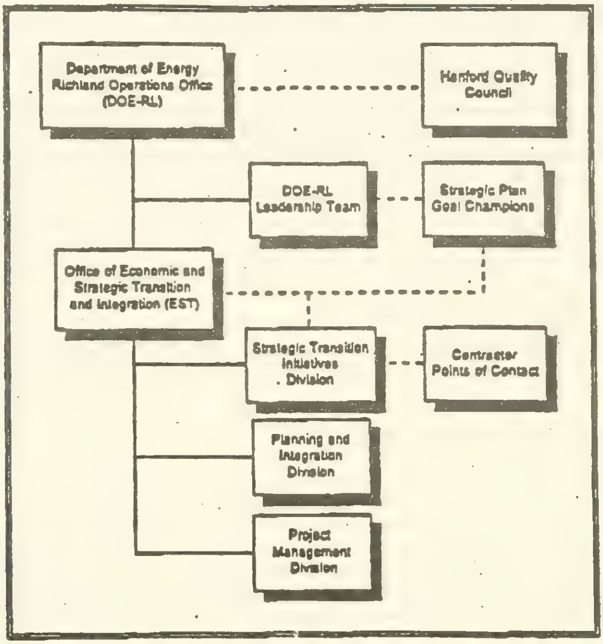
Department of Energy Richland Operations Office (DOE-RL)
Hanford Quality Council
DOE-RL Leadership Team
Strategic Plan Goal Champions
Office of Economic and Strategic Transition and Integration (EST)
Strategic Transition Initiatives Division
Contractor Points of Contact
Planning and Integration Division
Project Management Division

Figure 1. Organizational Roles

2.1 Department of Energy, Richland Operations Office

This section discusses the roles played in the cost savings effort by the Office of Economic and Strategic Transition and Integration (EST), which manages Hanford's transition activities; the Strategic Transition Initiatives Division (STI), which serves as the clearinghouse for Hanford reengineering and reinvention activities; and the upper management planning and decision-making groups which receive input from EST and STI to aid in determining site strategic direction.

2.1.1 Office of Economic and Strategic Transition and Integration

The Office of Economic and Strategic Transition and Integration is a RL line organization. The EST director reports directly to the RL Manager. EST manages the diverse activities associated with Hanford transition and ensures their integration with the ongoing activities necessary to accomplish Hanford's mission of cleanup, science and technology, and economic diversification. EST consists of three divisions: the Planning and Integration Division (PID); the Project Management Division (PMD); and as discussed below, the STI.

The PID is responsible for ensuring an integrated approach to Hanford mission and program planning and works with the STI to ensure the integration of reengineering/reinvention activities with the ongoing activities necessary to accomplishing the three-fold Hanford mission. The PID is also responsible for the systems engineering activities associated with site cleanup, the development of a technical baseline, and multi-year program plans.

The PMD ensures the application of sound project management practices to cleanup activities and assists RL program managers in developing cost and schedule control mechanisms for major Hanford programs.

2.1.2 Strategic Transition Initiatives Division

The STI tracks progress towards achieving the $1 billion savings goal established in the CEI. In addition, the STI is the focal point and clearinghouse for Hanford site-wide reengineering and reinvention activities. This division facilitates, integrates, coordinates, tracks, and reports on site-wide reengineering and reinvention initiatives ranging from process improvement efforts and value engineering studies to privatization and outsourcing initiatives. For selected initiatives, STI assigns project managers to manage the activities. The STI supports RL and the Hanford Quality Council in site strategic planning and works with other RL and Hanford Site organizations to ensure transition initiatives are focused on achieving site strategic goals. The Office of Economic Transition (OET), Hanford Performance Measurement Program (HPMP), Stand Down Project, and Value Engineering Program are all part of STI.

2.1.3 Upper Management Planning

The cost savings and reengineering efforts of the EST and the STI cannot operate in a leadership vacuum. They are, therefore, linked to leadership groups such as the Hanford Quality Council, the RL Leadership Team, and the Hanford Strategic Plan Goal Champions.

The Hanford Quality Council defines the mission and the vision for the Hanford Site and provides the strategic direction to achieve that vision. The Council defines the site's top-level values and goals, builds and maintains customer relationships, and provides guidance for the work to carry out the site mission. Council membership consists of the RL Manager, the chief executive officers of Hanford's major contractors, and representatives of union organizations.

The RL Leadership Team consists of the RL Manager and his direct reports. The Leadership Team will make key decisions concerning site-wide reengineering/reinvention targets, priorities, and implementation strategies. The Leadership Team determines how site resources will be applied to change Hanford through reengineering/reinvention, and decides who will lead key reengineering/reinvention initiatives.

The Hanford Strategic Plan Goal Champions are a group of RL senior managers to whom the RL Manager has assigned the responsibility for integrating site-wide reengineering/reinvention initiatives with the Hanford Site Strategic Plan. Their role is to support the Leadership Team. The Goal Champions are creating a "strategic framework" that facilitates maintaining a focus on the achievement of site strategic objectives. The Goal Champions will help to set priorities for site-wide performance improvement initiatives.

2.2 Hanford Site Contractors

Contractor reinvention/reengineering activities are centered in various organizations and/or groups within the respective Hanford contractor organizations. These groups are responsible for the overall integration, coordination and tracking of reinvention/reengineering activities within their company. They establish policy, procedures and, in conjunction with senior management, the priority of their various reinvention/ reengineering targets. They facilitate and support line organizations in reinvention efforts, as required, and are responsible for tracking and reporting company-wide savings toward goals and objectives established by senior management and RL. Contractor points of contact are directly involved with the STI.

2.3 Process Owner

A process owner may be the contractor manager responsible for a particular company process or may be the cognizant RL manager as part of their performance monitoring role. It is the process owner who identifies and manages reengineering/reinvention efforts in their area of responsibility. They also may take ownership of grass roots efforts at process improvement or cost savings within their area of responsibility.

3.0 Approach

To achieve the $1 billion savings goal, a wide range of initiatives are being established. The coordination of these initiatives is centered in the STI. As described above, the STI will catalyze, facilitate, and integrate initiatives to achieve the Hanford Site strategic objectives, including performing the cleanup mission faster, better, and cheaper. This section describes the approach that the STI will take, including a discussion of the types of initiatives that will be carried out and how key improvement targets will be identified. Several ongoing efforts have recently been realigned under the STI and it is the STI's goal to integrate these efforts with other planned improvement efforts in a total quality management framework.

3.1 Types of Initiatives

STI envisions three tiers of performance improvement initiatives being carried out across the Hanford Site, reengineering initiatives, process improvements, and functional improvements. These tiers are distinguished below:

Tier 1	*Reengineering initiatives* deal with the key mission processes, or "value chains," of the overall Hanford enterprise.[1]
Tier 2	*Process improvements* are directed by management and cross-cut functional organizations of an individual contractor, the DOE, or several contractors and the DOE.
Tier 3	*Functional improvements* are initiated at the "grass-roots" level by individuals within a particular contractor and/or DOE organization.

STI involvement in these initiatives will range from substantial for Tier 1 initiatives to minimal for Tier 3 initiatives.

3.2 Identification of Improvement Targets

Opportunities for process and functional improvements -- Tier 2 and 3 initiatives -- will be discovered primarily through a "bottoms-up" process, although some Tier 2 initiatives involving multiple contractors and the DOE will require top-down planning and analysis.

Numerous improvement efforts are already under way at Hanford. Many efforts have been initiated as a result of the CEI, and some prior analysis was completed before these targets were identified. They range from Tier 1 to Tier 3 efforts, depending on the interpretation of the particular effort.

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[1] *Reengineering* is a fundamental rethinking and radical redesign of an entire business system led by senior management to achieve dramatic improvements in cost, quality, service, and speed.

Value chains are series of interconnected activities forming a process that delivers value in the form of products/services to a defined customer.

Other improvement efforts are being generated as a result of the Environmental Restoration and Waste Management Standdown conducted in February 1994. Four Quality Improvement Teams (QITs) have already been formed to address Standdown issues. These issues are Tier 2, that is, they invariably cross-cut the site. QITs are championed by senior RL managers and composed of multidisciplinary teams of contractor and RL personnel.

The STI's primary responsibility regarding the CEI and Standdown obstacles is to ensure these efforts are integrated with other Hanford improvement efforts planned and/or under way, track and report on their progress, and account for any savings realized as a result of implementation actions. The STI will work with the Strategic Plan Goal Champions in doing this.

Tier 1 initiatives, those involving site-wide reengineering, will require top-down direction preceded by a "front-end analysis." In any case, a decision to allocate site resources to facilitate/support any given initiative will be based on well-defined selection criteria.

3.2.1 Front-End Analysis

The STI is currently carrying out an analysis designed to help senior site management identify candidate reengineering targets. This analysis is referred to as a "front-end analysis" in that it precedes the identification of reengineering targets and the detailed analyses that will be conducted once reengineering initiatives have been commissioned.

The front-end analysis is a six-step process beginning with the development of high-level process maps for key mission processes. The analysis is currently focusing on cleanup processes and is using the "value chain" concept for developing the process maps.

Based upon the front-end analysis, recommendations on reengineering targets will be made to the Goal Champions and, in turn, the RL Leadership Team. The decision to undertake true reengineering of any given process will entail senior management commitment and a significant investment of resources, but the expected payback will be substantial.

3.2.2 Selection Criteria

The STI is developing a decision analytic method for selecting site-wide initiatives that merit RL endorsement and support. This method involves a set of criteria broken out into benefits and risks. The criteria currently being considered are drawn from the strategic planning process.

4.0 Cost Savings Schedule, Tracking, and Validation

To measure progress toward the $1 billion savings, specific cost savings goals, by fiscal year, have been established. This section provides the savings goal schedule and descriptions of how savings will be tracked and validated.

4.1 Cost Savings Schedule

Fiscal year goals for achieving the $1 billion cost savings stipulated in the Cost and Management Efficiency Initiative are shown in Table 1, below.

Table 1. Cost Savings Goals
($ in Millions)

	FY-94	FY-95	FY-96	FY-97	FY-98	CUM 5-YEARS
TIER 1	40	60	60	70	70	300
TIER 2	50	80	80	90	100	400
TIER 3	40	60	60	70	70	300
TOTALS	130	200	200	230	240	1000

4.2 Baseline and Validation

Progress toward meeting the CEI cost savings goal of $1 billion from FY 1994 through FY 1998 will be measured against the baseline as defined and discussed herein. All workscope performance and cost savings will be measured against the FY 1995 Multi-Year Program Plans (MYPPs), Site Support Program Plans (SSPPs), and Project Plans (in the case of projects that are capital-funded). The MYPPs for FY 1995 were approved by RL on September 23, 1994, and reflect the technical scope, schedule, cost and work activity baseline. The baseline is integral to the Hanford Site Management System (SMS) and has been validated in accordance with RL Implementing Directive (RLID) 5700.4, "Cost Estimating" and RL Procedure (RLP) 5700.9, "Cost Estimating Validation." These documents provide specific direction for the preparation, validation, and approval of cost estimates supporting the MYPPs.

4.2.1 Cost Baseline

The specific cost baseline within the MYPPs is the approved (and validated) cost estimate for the workscope, referred to as the Budgeted Cost of Work Scheduled (BCWS). Savings will be measured, tracked, and reported against the approved BCWS and will be identified as either baseline cost reductions or baseline cost avoidances.

4.2.2 Cost Reductions

The cost reductions will result from process improvements or from any of several employee initiative programs that identify "low value" work activities that can be reduced or eliminated without impact on committed deliverables. Cost reductions will also occur when workscope is completed for less than budgeted due to pricing reductions or estimate underruns. Cost reductions that occur in indirect cost categories (such as overhead budgets, assessment pools, etc.) will be tracked separately. The programs/projects may see these savings passed back to them through rate or assessment reductions. These passbacks will not be double counted toward meeting the cost savings goal. All cost savings will be documented on an SMS change request form. The activity or initiative that generates the savings will be documented on a Cost Reduction Proposal form and must satisfy the associated validation criteria.

4.2.3 Cost Avoidance

The baseline cost avoidances will result when the costs of new requirements, changed or unusual circumstances, changes in public laws or statutes, changes in guidance from advisory entities, or the costs of changes in regulatory interpretations are avoided because of specific actions by a Hanford contractor. Absent the proactive actions of the contractor, these costs would have resulted in an increase to the baseline. Savings that are the result of baseline cost avoidances must be substantiated by suitable empirical data and will be captured on a change request. The change request documents the estimated cost but requests zero funds to perform the work. The initiative that allows the cost to be avoided will be documented on a cost reduction proposal. These initiatives do avoid impacts to planned work, but will not generate funds that would be available for reuse to accelerate schedule and accomplish more cleanup.

4.2.4 Productivity Commitment

In recognition of the Hanford commitment to achieve $1 billion in cost savings over a five-year period, funding is being reduced through the Internal Review of the Budget and subsequent Congressional appropriations processes. Consequently, the value of the workscope that must be accomplished (the BCWS) is greater than funds provided by the amount of productivity commitment, representing a debt to be paid off via savings during a given fiscal year. Only baseline cost reductions will be applied against the established fiscal year productivity commitment. Both baseline cost reductions and baseline cost avoidances will be applied against the $1 billion cost savings goal. Workscope deferrals that generate available funds will be tracked from a performance standpoint. Funding from a behind-schedule activity must be maintained within the program in order that the scope can be completed at a later time. These funds will be tracked separately and will not count as savings toward the productivity commitment or the $1 billion goal.

5.0 Initiatives

This section describes current efforts by RL and its site contractors to establish initiatives for achieving the $1 billion savings.

5.1 Department of Energy, Richland Operations Office

The RL Leadership Team will select certain activities which involve multiple contractors or are a site-wide function for special emphasis by the Strategic Transition Initiatives Division (STI). Selected initiatives will use a common approach for planning, front-end analysis, baselining, redesigning and implementation. Where possible, the initiatives will report through and be supported by the RL process owner. Each initiative will be led full-time by a RL project manager, supported as needed by RL, Hanford Contractor personnel and outside consultants. As they are identified, leaders of each initiative will develop planning documents which include schedules, budgets and deliverables.

Currently, STI management has identified four activities for special emphasis: Infrastructure/Site Services, Information Management, Training, and Procurement. The Information Management, Training, and Site Services initiatives are in the early formulation phase. Initiative team members are examining what plans need to be prepared, what the work scope might be, what talents are needed for the initiative team, and what the proposed upcoming fiscal year budget should be. The Procurement initiative will be started when a RL manager is assigned. The Infrastructure activity has been in progress for some time and its status in relation to the overall STI process is being evaluated. With adequate funding for Fiscal Year 1995, the four initiative managers would identify the vision, the necessary actions, and the implementation strategy and schedule for the remainder of Fiscal Year 1995 and beyond.

Responsibility for the 17 action areas in the Cost and Management Efficiency Initiative resides within RL. Owners have been established within the cognizant program or project office and efforts to complete the assigned actions are being reported on a monthly basis to the STI with quarterly progress reports being provided to Ecology and the EPA.

5.2 Hanford Site Contractors

Hanford Contractors may initiate activities which support site cost and management efficiency initiatives. The STI will provide support in the form of change management tools and experience to contractor initiatives. The STI will provide some level of oversight on these activities and assure that changes are reported using existing contractor to RL mechanisms. This oversight will seek to identify possible applications beyond the contractor-specific implementation. Oversight can help assure that the actions by one entity do not reduce the possible benefits of a larger opportunity.

5.2.1 Westinghouse Hanford Company

Westinghouse Hanford Company (WHC) has prepared a *Project Plan For Cost Competitiveness* which provides a structured approach for quantifying and achieving cost savings. This plan describes the aggressive approach WHC, BCS Richland, and ICF Kaiser Hanford will take to make its work at Hanford more cost competitive -- allowing additional programmatic workscope to be completed without additional funds. To become increasingly cost competitive WHC must change the way it performs its work to reduce the resources required to meet the established deliverables.

WHC embraces the Total Quality philosophy, recognizing that to become more competitive improvements must come from throughout the organization. The WHC strategy reflects both top-down and bottom-up initiatives and encourages empowerment, ownership, and buy-in at all levels of the organization.

The WHC Business Model establishes four primary mission areas (Tank Waste Remediation Systems, Spent Nuclear Fuel, Transition Projects, and Waste, Analytical and Environmental) with direct focus on achieving technical deliverables with fewer funds. In addition, WHC uses many cross-cutting technical and administrative processes. These processes enable accomplishment of mission deliverables as quickly as possible. Their focus is to support the primary missions by streamlining or eliminating work, thereby reducing the administrative burden.

WHC has chosen a systems approach for organizing its cost competitiveness initiatives. This approach is based on the Cost Competitiveness Strategy and the WHC Business Model. The result is a three-tier (Strategic Initiatives, Cross-Cutting Processes, and Grass-Roots Improvements) approach. This approach ensures focused attention on the commitment to the major elements necessary to improve cost competitiveness. Additionally, this approach provides the structure to organize a large number of individual initiatives into manageable groupings. This breakdown is called the WHC Cost Savings Road Map.

WHC has identified an inventory of potential target initiatives that will contribute toward the company goal of becoming more cost competitive. Additional initiatives and more detailed information will be developed as their cost competitiveness strategy is further defined through the current contract negotiations. Savings goals have been established for the five-year period (FY 1994 - 98). However, a number of factors, such as labor relations, socioeconomic trends, and available technical expertise could significantly impact these goals.

5.2.2 Pacific Northwest Laboratory

Over the last few years the Pacific Northwest Laboratory (PNL) has had a disciplined effort to ensure the Laboratory has both the technical capabilities and the management and support structure needed to be a leader in this time of change. PNL has invested heavily in its core competencies, strengthened its alignment to the Department of Energy's core missions, and improved productivity.

While PNL has made great strides in becoming more competitive, the Laboratory recognizes it must now respond to additional challenges -- most notably pressure to decrease the federal budget deficit and the intent of the Secretary of Energy and the Office of Science and Technology Policy to reconfigure the science and technology laboratory complex (the DOE, NASA and DoD laboratories).

PNL will continue to make significant changes in cost, efficiency, and overall productivity to continue its success as a research and development provider. In the near future, the Laboratory will reduce costs, improve processes, and add value to the products it delivers to its customers. Specifically, PNL will do the following:

- evaluate new methods for acquiring services
- implement process improvement activities to improve the efficiency and effectiveness of operations in the Laboratory
- analyze the way products are delivered to customers and evaluate the things being done in the context of the value it adds to the Laboratory's customers
- reduce or eliminate expenditures
- partner with DOE to identify non-value-added requirements and identify process improvements.

PNL's vision is to become the highest value provider of research and development products and services of any laboratory in the DOE system and in the marketplace. PNL's target is to increase productivity by at least 25 percent over the next three years (FY 1995-FY 1997). This target is based on comparisons with other organizations and what customers have told PNL it needs to do to become "best in class."

PNL has already begun a number of initiatives to improve productivity and reduce costs. These initiatives include development of a purchasing card program, new ways of procuring travel services and changes in the way utilities and other shared services are acquired.

In addition, PNL has engaged McKinsey and Company, an internationally recognized consulting firm, to assist the Laboratory with developing an assessment and action plan for increasing productivity and the value it delivers to its clients. This program, termed Achieving the Competitive Edge (ACE), will be customized to meet the needs and priorities of PNL and the Department of Energy.

6.0 Site and Area Impacts

RL acknowledges that as a result of implementing cost and management efficiency initiatives, the Hanford workforce will be reduced. Public Law 102-484, the National Defense Authorization Act for Fiscal Year 1993, Section 3161, Department of Energy Defense Nuclear Facilities Workforce Restructuring Plan, provides a framework upon which to build impact mitigation plans. The law requires development of plans which identify several alternatives for impacted workers. These plans can include retraining for other positions, both internal to the site and external, and voluntary termination programs which provide options for education or relocation. Plans will also provide outplacement programs, providing extensive assistance, including preferential hiring mechanisms, to assist involuntarily impacted workers in obtaining other employment.

Through the RL Office of Economic Transition and its interface with local and regional agencies, opportunities will be identified to 1) outsource portions of Hanford tasks to private companies, and/or 2) provide "seed" money to existing or new entities to initiate companies providing services and/or products both to the Hanford Site and the public sector. Options will also be sought for the conversion of onsite assets to commercial use, providing continued or re-use of Hanford assets as well as additional employment. Specific plans are developed as opportunities are identified.

RL anticipates that cost improvement and management efficiency initiatives will further support its partnership with the communities, sovereign nations and stakeholders in developing and sustaining a diversified economy, no longer dependent on the federal government for the majority of its economic base. RL envisions the Hanford Site as a model for cost-effective operations, supporting a safe and healthy environment of flourishing technology development and resulting in an area opened to a multitude of public and private uses.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 29 (b):	Please provide a listing of all renegotiated agreements to date.
Answer:	Of the 108 Federal and State agreements negotiated to date, the Department has renegotiated and/or modified twelve agreements. Of these twelve agreements, only the agreements for Rocky Flats and Hanford have been significantly modified (e.g., renegotiated milestones) from the original agreement. The remaining agreements have undergone minor modification. These agreements are identified by State and site in the attached tables.

OFFICE OF ENVIRONMENTAL MANAGEMENT
LISTING OF RENEGOTIATED/MODIFIED AGREEMENTS [*]
(Revised March 1995)

Washington

SITE	PARTIES	STATUS	TYPE OF AGREEMENT	DATE EXECUTED	AMENDMENT DATES
Hanford	DOE/EPA/WA	Open	RCRA/CERCLA	05/15/89	05/15/91 09/09/91 08/31/92 01/25/94

Colorado

SITE	PARTIES	STATUS	TYPE OF AGREEMENT	DATE EXECUTED	AMENDMENT DATES
Rocky Flats [1]	DOE/EPA/CO	Open	RCRA/CERCLA	07/31/86	01/22/91

[1] Renegotiations are currently ongoing at Rocky Flats.

Missouri

SITE	PARTIES	STATUS	TYPE OF AGREEMENT	DATE EXECUTED	AMENDMENT DATES
Weldon Spring	DOE/EPA	Open	CERCLA/NEPA	08/22/86	01/28/92

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[*] Agreements include Federal Facility Compliance Agreements, Federal Facility Agreements, Settlement Agreements, and Consent Orders.

OFFICE OF ENVIRONMENTAL MANAGEMENT
LISTING OF RENEGOTIATED/MODIFIED AGREEMENTS [*]
(Revised March 1995)

Ohio

SITE	PARTIES	STATUS	TYPE OF AGREEMENT	DATE EXECUTED	AMENDMENT DATES
Fernald	DOE/EPA	Open	CERCLA/RCRA/CAA	07/19/86	06/30/88
Fernald	DOE/OH	Open	State Consent Decree	12/02/88	01/22/93
Fernald	DOE/EPA	Open	CERCLA/ Consent Agreement	04/09/90	09/14/91
Mound	DOE/EPA/OH	Open	CERCLA	08/06/90	07/15/93

South Carolina

SITE	PARTIES	STATUS	TYPE OF AGREEMENT	DATE EXECUTED	AMENDMENT DATES
Savannah River	DOE/SC	Open	Clean Water Act	01/03/84	08/27/85 08/31/87
Savannah River [2]	DOE/SC	Closed	RCRA	05/01/87	06/15/89
Savannah River[2]	DOE/SC	Closed	RCRA	11/12/87	05/09/91
Savannah River	DOE/SC	Open	Clean Water Act	02/27/90	01/16/91
Savannah River	DOE/EPA	Open	RCRA	03/13/91	04/24/92

[2] Closed. DOE environmental compliance activities under the agreement have been completed.

[*] Agreements include Federal Facility Compliance Agreements, Federal Facility Agreements, Settlement Agreements, and Consent Orders.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 29c: On page 9 of the Attachment, it is also stated: "Budget realities are forcing the Department to continue its renegotiation of many existing compliance agreements, thus creating a more workable, affordable, and results-oriented compliance regime. Considerable progress already has been made, including the 1993 renegotiation of the Hanford agreement at a savings of more than a billion dollars; and renegotiation of dozens of smaller agreements throughout the country ... Restructured program, involving $4.4 billion costs reductions over five years, will be put in place during 1995."

(c) Please provide the analytical basis for the $4.4 billion figure.

Answer: In support of the President's proposed deficit reduction, Middle Class Bill of Rights, and need for a leaner federal government, the Environmental Management (EM) program is expected to contribute $4.4 billion in outlay savings over the next five years. These cuts are prompting an acceleration of changes that were previously identified by the EM program as necessary. The $4.4 billion savings commitment is aggressive and assumes substantial changes in the way the EM program is run. The basis for these savings is as follows:

- Significant increases in productivity and efficiency.
- Reducing the number of contractor employees by about 34 percent from 1994-1996, in accordance with section 3161 of the Defense Authorization Act of 1993.
- Renegotiating $30 billion worth of contracts to include greater incentives for outstanding performance and to ensure that contractors take on a larger share of risks associated with doing business.
- Reauthorization of Superfund to codify the Administration's proposed land use provisions that would base cleanup standards on sensible levels of risk given different future land uses.
- Working closely with EPA and State regulators to renegotiate compliance agreements to better reflect the realities of budget constraints and the dynamic nature of environmental conditions at the sites.
- Changes in budget structure site-specific appropriations to provide DOE management and regulators greater flexibility in responding to changing environmental conditions and

priorities (e.g., newly identified urgent risks) at the sites.

- Adopting multi-year funding of up to three years for sites beginning in FY 1997.
- Privatizing appropriate operations that can be run more cost effectively by the private sector.

QUESTIONS FROM REPRESENTATIVE ROHRABACHER

Question 30 (a): On page 10 of the Attachment, it is stated that "in the Environmental Management program, the Assistant Secretary established the Office of Public Accountability."

a. What is the mission of the Office of Public Accountability?

Answer: The Office of Public Accountability's mission is to provide the leadership and services required to ensure the accomplishment of EM Strategic Goal number six: ESTABLISH A STRONGER PARTNERSHIP BETWEEN THE DEPARTMENT OF ENERGY AND ITS STAKEHOLDERS. Department activities directly affect public health and safety and the environment - for which the Department must exercise stewardship and be responsive to the public interest. To effectively implement the Environmental Management program the Department needs broad based stakeholder participation. The ability to obtain meaningful stakeholder participation is complicated by the especially complex demands placed on Environmental Management activities by: the Department's low level of credibility among many of its stakeholders; the demands of statutes, regulations, and agreements affecting the extensive network of environmental management activities.

The guiding principle of the Office of Public Accountability is that the public has a right to knowledge of and the opportunity to influence the decisions, plans and implementation of programs conducted by the Office of Environmental Management. Additionally, public participation rights have been codified in the many environmental laws that apply to the Department and in Department Orders, policy, and guidance.

Coordination of stakeholder interaction activities is essential to building stronger partnerships between the Department and its stakeholders; to assure overall compliance with Department requirements; to provide for a consistent internal approach; and to permit effective integration of public participation and program management planning and execution to assure the best use of available resources.

QUESTIONS FROM REPRESENTATIVE ROHRABACHER

Question 30(b): On page 10 of the Attachment, it is stated that "in the Environmental Management program, the Assistant Secretary established the Office of Public Accountability."

b. How many FTE's are in the Office?

Answer: The Office of Public Accountability has 20 FTE's.

QUESTIONS FROM REPRESENTATIVE ROHRABACHER

Question 30(c): On page 10 of the Attachment, it is stated that "in the Environmental Management program, the Assistant Secretary established the Office of Public Accountability."

(c). What is the Office's funding level?

Answer: The Office of Public Accountability's funding level is $28.6 million for Fiscal Year 1995. [Note: Because the Office was created in late 1993, funding for the Office's activities comes from several program accounts in FY 1995. The budget for FY 1996 will be the first consolidated budget.]

The Office's funding supports activities in five major areas: (1) Public Participation Forums; (2) Tribal activities; (3) Environmental Justice activities; (4) Outreach and Communications; and (5) Public Involvement in Decision-Making.

Public Participation Forums ($6.5 million) includes support for 11 citizen advisory boards created to provide recommendations on funding priorities, future use, acceptable cleanup standards, and other issues. An evaluation of the effectiveness of these boards is also underway.

Tribal funding ($12 million) supports grants to and cooperative agreements with Native American tribes at and near the Department's sites, emergency response training, other training and educational programs, and the State and Tribal Government Working Group.

Environmental Justice funding ($1.9 million) is directed to ensuring effective participation by minority and low-income community stakeholders in the planning, decision-making and implementation of Environmental Management activities.

Outreach and Communications ($2.3 million) provides access to the public to all Environmental Management publications, testimony, other documents, and the Center for Environmental Management Information. The Center allows stakeholders to ask questions and share their concerns on the Environmental Management program through an interactive bulletin board and 1-800 telephone line. In addition, we produce reports such as "Environmental Management 1996" and periodic newsletters to communicate with the public. This also includes training for the Department's managers on how to involve and communicate effectively with stakeholders.

Public Involvement in Decision-Making ($5.9 million) supports the Future Use Project Office, which is designed to identify stakeholder-preferred future land use options for the Department's sites. It also funds ongoing discussions with state and local governments, regulators and other stakeholders concerning ways to address potential budget shortfalls and involve them in the Environmental Management program's decision-making.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 31: On Page 11 of the Attachment, it is stated that "[d]uring the next year, the Department will request its science advisory committees to examine the balance between university and laboratory research programs in those instances where this has not been done recently."

Please provide a copy of (a) the charter for each of the Department's science advisory committees; (b) a list of each these committee's membership -- including the job title/affiliation for each member of these committees as well as any such committee subcommittees/working groups/panels; and (c) each science advisory committee's funding level and the source of that funding.

Answer: The Department currently has 10 science advisory committees. A copy of each committee's charter; (b) membership and subcommittees/working groups/panels; and (c) the funding level and the source of that funding are provided for the record.

DEPARTMENT OF ENERGY
SCIENCE ADVISORY COMMITTEES

1. American Statistical Association Committee on Energy Statistics
2. Basic Energy Sciences Advisory Committee
3. Federal Advisory Committee to Develop On-site Innovative Technologies for Environmental Restoration and Waste Management
4. Fusion Energy Advisory Committee
5. Health and Environmental Research Advisory Committee
6. High Energy Physics Advisory Panel
7. Hydrogen Technical Advisory Panel (Statutory)
8. Inertial Confinement Fusion Advisory Committee/Defense Programs
9. Metal Casting Industrial Advisory Board (Statutory)
10. National Electric and Magnetic Fields Advisory Committee (Statutory)

DEPARTMENT OF ENERGY

CHARTER

AMERICAN STATISTICAL ASSOCIATION COMMITTEE ON ENERGY STATISTICS

1. Committee's Official Designation:

American Statistical Association Committee on Energy Statistics.

2. Committee's Objectives and Scope of Activities and Duties:

The activities of the Committee on Energy Statistics in support of the Energy Information Administration include:

a. Periodic reviews of elements of Energy Information data collection and analysis programs and the provision of recommendations;

b. Advice on priorities of technical and methodological issues in the planning, operation, and review of Energy Information statistical programs; and

c. Advice on matters concerning improved energy modeling and forecasting tools, particularly regarding their functioning, relevancy, and results.

3. Time Period Necessary for the Committee to Carry Out Its Purpose:

The Committee is a permanent committee of the American Statistical Association. In view of the goals and purposes for which the Committee's advice is sought, its utilization is expected to be continuing in nature.

4. Official to Whom This Committee Reports:

The Committee will report to the Administrator of the Energy Information Administration relative to the issues for which Committee advice is sought.

5. Agency Responsible for Providing Necessary Support for This Committee:

The Department of Energy. Primary support shall be furnished by the Energy Information Administration.

6. Description of Duties for Which the Committee is Responsible:

The duties of the Committee as they relate to Energy Information are solely advisory and are stated in paragraph 2, above.

7. Estimated Annual Operating Costs in Dollars and Person-Years:

$70,000, 1 person-year

8. Estimated Number and Frequency of Meetings:

The Committee will meet with the Energy Information approximately 2 times a year at 6-month intervals. The Committee may meet independently at times and as frequently as the Committee wishes.

9. Committee's Termination Date (If Less Than 2 Years from Date of Establishment or Renewal):

Not applicable.

10. Subcommittee(s):

The Committee on Energy Statistics may form subcommittees from time to time to facilitate its functioning. Ad hoc members from outside the Committee on Energy Statistics may be appointed by the subcommittee chairperson to ensure the expertise necessary to conduct the subcommittee's business.

11. Members:

a. Committee members are appointed by the President of the American Statistical Association.

b. Approximate number of Committee members: 17

c. Membership terms are for a period of 3 years. Committee members may be reappointed to additional terms following review.

12. Chairperson:

The Chairperson and Vice-chairperson are elected by the Committee for a 2-year term.

The charter for renewal of the Advisory Committee named above is hereby approved on:

SEP 30 1994

Date

Marcia L. Morris

Marcia L. Morris
Advisory Committee Management Officer

SEP 30 1994

Date Filed

DEPARTMENT OF ENERGY

CHARTER

BASIC ENERGY SCIENCES ADVISORY COMMITTEE

1. Committee's Official Designation:

   Basic Energy Sciences Advisory Committee

2. Committee's Objectives and Scope of Activities and Duties:

   The activities of the Basic Energy Sciences Advisory Committee include:

   a. Periodic reviews of elements of the basic energy sciences program and recommendations based thereon.

   b. Advice on long-range plans, priorities, and strategies to address more effectively the scientific aspects of energy-related basic energy sciences.

   c. Advice on appropriate levels of funding to develop those plans, priorities, and strategies and to help maintain appropriate balance between competing elements of the basic energy sciences program.

   d. Advice on scientific aspects of basic energy sciences issues of concern to the Department of Energy as requested by the Secretary or the Director of Energy Research.

3. Time Period Necessary for the Committee to Carry Out Its Purpose:

   In view of the goals and purposes of the Committee, it is expected to be continuing in nature.

4. Official to Whom This Committee Reports:

   The Committee will report to the Director of Energy Research.

5. Agency Responsible for Providing Necessary Support for This Committee:

   The Department of Energy. Within the Department, primary support shall be furnished by the Office of Energy Research.

6. Description of Duties for Which the Committee is Responsible:

   The duties of the Committee are solely advisory and are stated in paragraph 2, above.

7. Estimated Annual Operating Costs in Dollars and Person-Years:

   $100,000; one-half person-year.

8. Estimated Number and Frequency of Meetings:

The Committee will meet periodically, approximately four times a year.

9. Committee's Termination Date (If Less Than Two Years from Date of Establishment or Renewal):

Not applicable.

10. Subcommittee(s):

To facilitate the functioning of the Basic Energy Sciences Advisory Committee, subcommittees may be formed. The objectives of the subcommittees are to make recommendations to the parent committee with respect to particular matters related to the responsibilities of the parent committee.

11. Members:

a. Committee members shall be appointed by the Secretary of Energy.

b. Approximate number of Committee members: 19

12. Chairperson:

The Chairperson shall be appointed by the Secretary of Energy.

This Charter for the Advisory Committee named above is hereby approved on:

JAN - 6 1995

Date

for Anne Whitman

Marcia L. Morris
Advisory Committee Management Officer

JAN - 6 1995

Date Filed

CHARTER

Federal Advisory Committee
to
Develop On-Site Innovative Technologies
for
Environmental Management

1. PURPOSE: This charter renews the "Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management" (DOIT Committee), for performing their duties and responsibilities under provisions of the Federal Advisory Committee Act (FACA), 5 U.S.C. App. 2 section 14(a)(2)(a).

2. AUTHORITY: It is determined that continuance of the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management is in the public interest and supports the Departments of Defense, Interior, and Energy and the Environmental Protection Agency in performing their duties and responsibilities under Section 120 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Section 6001 of the Resource Conservation and Recovery Act (RCRA), and other authorities pertaining to environmental restoration and waste management at Federal and non-Federal sites.

3. OBJECTIVE AND SCOPE OF ACTIVITY: The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management will serve as the primary vehicle for recommending a program that can be adopted to implement a Memorandum of Understanding regarding environmental management in western states. This memorandum was signed in July 1991 by representatives from the U.S. Departments of Defense, the Interior, and Energy, the U.S. Environmental Protection Agency and the Western Governor's Association (WGA), the latter representing twenty western state and territorial governors.

The objective of the Memorandum of Understanding is "to establish a more cooperative approach to development of technical solutions to environmental restoration and waste management problems shared by States, commercial entities, and the Federal Government. The regional approach will serve as a demonstration of principles and practices which may be adopted nationally."

The Memorandum of Understanding's objective is also to encourage cooperation and communication among the Federal signatories and the western governors "in research, development, and demonstration...of cost-effective waste management technologies germane to Federal lands and facilities in western States and insular areas."

4. FUNCTIONS: As indicated above, the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management function is to recommend a program to implement the tasks of the Memorandum of Understanding. The tasks of the Memorandum of Understanding, among other things, are: (1) identification of technology needs at Federal facilities in western states; (2) identification/assessment of emerging technologies within the Federal and private sectors; (3) assessment of the effectiveness of technology selection processes; (4) identification of regulatory, institutional, or other government barriers to technology development; and (5) identification of workforce planning/ education requirements.

The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management will solicit information from private and public stakeholders to prepare an annual report containing findings addressing the above tasks. The report will also list by priority, regional waste management research, development and demonstration needs on Federal lands and facilities and assess existing commercial capabilities and technology development initiatives. The report will include an assessment of emerging Federal waste management and cleanup technologies, regulatory and institutional issues related to implementation, and the effectiveness of technology selection processes. The report will also highlight current funding levels and will focus on the most pressing waste management problems at Federal sites. Specific promising new technology approaches for these problems will be identified in the report for possible demonstration projects.

The report will be completed and submitted to the signatories of the Memorandum of Understanding or their successors no later than the last day of February of each year for use as a resource in the formulation of the Nation's waste cleanup effort.

The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management will also prepare in its report recommendations for technology demonstrations at selected host sites that address the highest priority cleanup needs. In addition, the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management will recommend regulatory and institutional reforms to eliminate unnecessary barriers to technology development and implementation of effective remedial technologies at Federal facilities and sites.

5. COMPOSITION: The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management will consist of eight members: one from each Federal signatory agency and four representing the western governors. In addition, there will be two ex officio members, one from the U.S. Office of Management and Budget (OMB) and one from the Western Governors' Association (WGA). The eight members of the Committee will be four governors recommended by the WGA and the Secretaries of Defense, Interior and Energy, and the Administrator of the Environmental Protection Agency. These members can send as their designees a senior staff member with responsibility within their respective agencies or States for environmental restoration and waste management technical issues.

The members will also appoint representative(s) to serve on technical work groups, and the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management is authorized to use such limited scope work groups for any purpose consistent with the Charter. The individuals appointed to work groups will represent the following interests in an appropriate mix and balance: State government, Federal agencies, tribal government, public interest groups, environmental groups, waste cleanup industry, waste cleanup support industry, Federal laboratories, universities and colleges, and other interested and affected parties.

Such work groups shall report back to the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management. Work groups have no authority to make decisions on behalf of the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management, nor can they report directly to the FACA Committee host agency.

Appropriate members shall be selected and appointed for the two-year term of the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management charter. A full-time salaried official or regular employee of one of the Federal signatories will serve as the Designated Federal Officer and will be present at all meetings. The Designated Federal Officer is authorized to adjourn any meeting whenever such official determines it to be in the public interest to do so.

The host Federal agency will pay as authorized by 5 U.S.C §5703 travel and per diem expenses for Committee and work group members. Federal employees serving on the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management shall not receive compensation other than their salaries and members may receive reimbursement for travel expenses in accordance with five U.S.C. section 5703. The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management estimated annual operating cost is approximately $700,000.00. In addition, the host agency will provide funding for two work-years of staff support. The Department of Energy (DOE) will be the host Federal agency for this charter period and the DOE's Office of Technology Development within the Office of Environmental Management will provide administrative and process support to the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management. The Deputy Assistant Secretary, Office of Technology Development, Department of Energy, will serve as the Designated Federal Officer.

The Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management will meet two times per year at a minimum and will follow FACA guidelines regarding notification and open meetings. Work groups will meet as necessary to carry out support activity for the Committee and will also follow FACA guidelines regarding open meetings.

6. DURATION: Under Section 14 of FACA, the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management renewed charter will exist for two years or when the need for the committee terminates, whichever is earlier.

Since the July 1991 Memorandum of Understanding is to run for five years, it is anticipated that the Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Management Charter will be renewed as necessary to meet the terms of the Memorandum of Understanding.

DEC - 9 1994
Approval Date

Advisory Committee
Management Officer

DEC - 9 1994
Date Filed

DEPARTMENT OF ENERGY

CHARTER

FUSION ENERGY ADVISORY COMMITTEE

1. Committee's Official Designation:

   Fusion Energy Advisory Committee

2. Committee's Objectives and Scope of Activities and Duties:

   The Fusion Energy Advisory Committee provides advice and guidance on a continuing basis to the Director, Office of Energy Research, on the Fusion Energy Program, including:

   a. Periodic assessments of both the magnetic and inertial fusion energy program issues and recommendations of any changes considered desirable on the basis of scientific and technological advances or other factors;

   b. Advice on the merits of technical options, long-range plans, priorities, and strategies to demonstrate the scientific and engineering feasibility of fusion;

   c. Advice on recommended levels of funding appropriate to implement those strategies and to help maintain appropriate balance among the various elements of the fusion energy program; and

   d. Advice and guidance on any issues relating to the fusion energy program as requested by the Secretary or the Director, Office of Energy Research.

3. Time Period Necessary for the Committee to Carry Out Its Purpose:

   In view of the goals and purposes of the Committee, it is expected to be continuing in nature.

4. Official To Whom This Committee Reports:

   The Committee will report to the Director, Office of Energy Research.

5. Agency Responsible for Providing Necessary Support for This Committee:

   The Department of Energy. Within the Department, primary support shall be furnished by the Director, Office of Energy Research, through the Office of Fusion Energy.

6. Description of Duties for Which the Committee is Responsible:

   The duties of the Committee are solely advisory and are stated in Paragraph 2, above.

7. Estimated Annual Operating Costs in Dollars and Person-Years:

   $140,000; ¼ person-year/year.

8. Estimated Number and Frequency of Meetings:

   The Committee will meet approximately five times a year, or at least once each quarter.

9. Committee's Termination Date (If less than two years from date of establishment or renewal):

   Not applicable.

10. Subcommittee(s):

    To facilitate the functioning of the Fusion Energy Advisory Committee, subcommittees may be formed. The objectives of the subcommittees are to gather data, conduct analysis, and develop draft recommendations for the parent committee with respect to particular matters concerning plans and programs that are related to the responsibilities of the parent committee.

11. Members:

    a. Committee members shall be appointed by the Secretary of Energy for a term of two years.

    b. Approximate number of Committee members: 20

12. Chair:

    The Chair shall be appointed by the Secretary of Energy.

This Charter for the Advisory Committee named above is hereby approved on:

SEP 1 9 1993
Date

Marcia L. Morris
Howard H. Raiken
Advisory Committee
Management Officer

SEP 1 9 1993
Date Filed

DEPARTMENT OF ENERGY

CHARTER

HEALTH AND ENVIRONMENTAL RESEARCH ADVISORY COMMITTEE

1. Committee's Official Designation:

   Health and Environmental Research Advisory Committee

2. Committee's Objectives and Scope of Activities and Duties:

   The activities of the Health and Environmental Research Advisory Committee include:

   a. Periodic reviews of elements of the Biological and Environmental Research Program managed by the Office of Health and Environmental Research and recommendations based thereon;

   b. Advice on long-range plans, priorities, and strategies to address more effectively the scientific aspects of energy-related health and environmental issues of Departmental policies and programs;

   c. Advice on appropriate levels of funding to develop those plans, priorities and strategies and to help maintain appropriate balance among competing elements of the Biological and Environmental Research Program;

3. Time Period Necessary for the Committee to Carry Out Its Purpose:

   In view of the goals and purposes of the Committee, it is expected to be continuing in nature.

4. Official to Whom This Committee Reports:

   The Committee will report to the Director, Office of Energy Research.

5. Agency Responsible for Providing Necessary Support for This Committee:

   The Department of Energy. Within the Department, primary support shall be furnished by the Office of Energy Research.

6. Description of Duties for Which the Committee is Responsible:

   The duties of the Committee are solely advisory and are stated in Paragraph 2, above.

7. Estimated Annual Operating Costs in Dollars and Person-Years:

   $61,500; one-tenth person-year.

8. Estimated Number and Frequency of Meetings:

The Committee will meet approximately four times a year, at least once each quarter.

9. Committee's Termination Date (If Less Than Two Years from Date of Establishment or Renewal):

Not applicable.

10. Subcommittee(s):

To facilitate the functioning of the Health and Environmental Research Advisory Committee, subcommittees may be formed. The objectives of the subcommittees are to make recommendations to the parent committee with respect to particular matters related to the responsibilities of the parent committee. Ad hoc members from outside the Health and Environmental Research Advisory Committee may be appointed by the subcommittee chairperson to ensure the expertise necessary to conduct the subcommittee's business.

11. Members:

a. Committee members shall be appointed by the Secretary of Energy.

b. Approximate number of Committee members: 18

c. Membership will be renewed annually. Committee members may be reappointed to additional terms.

12. Chairperson:

The Chairperson shall be appointed by the Secretary of Energy.

This Charter for the Advisory Committee named above is hereby approved on:

NOV 2 2 1993
Date

for Marcia L. Morris
Howard H. Raiken
Advisory Committee Management Officer

NOV 2 2 1993
Date Filed

DEPARTMENT OF ENERGY

CHARTER

HIGH ENERGY PHYSICS ADVISORY PANEL

1. Committee's Official Designation:

High Energy Physics Advisory Panel

2. Committee's Objectives and Scope of Activities and Duties:

The High Energy Physics Advisory Panel provides advice on a continuing basis to the Director, Office of Energy Research, on the national high energy physics program, which encompasses the conduct of experimental and theoretical high energy physics research. The Panel activities include:

a. periodic reviews of the program and recommendations of any changes considered desirable on the basis of scientific and technological advances or other factors;

b. advice on long-range plans, priorities, and strategies for the national high energy physics program;

c. advice on recommended appropriate levels of funding to assure a world leadership position and to help maintain appropriate balance among the various elements of the program; and

d. advice on any issues relating to the program as requested by the Director of the Department's Office of Energy Research.

3. Time Period Necessary for the Committee to Carry Out its Purpose:

In view of the goals and purposes of the Panel, it is expected to be continuing in nature.

4. Official to Whom this Committee Reports:

The Panel will report to the Director of Energy Research.

5. Agency Responsible for Providing Necessary Support for this Committee:

Department of Energy

Within the Department, primary support shall be furnished by the Division of High Energy Physics, Office of Energy Research.

6. A Description of Duties for which the Committee is Responsible:

The duties of the Panel are solely advisory and are stated in Paragraph 2 above.

7. Estimated Annual Operating Costs in Dollars and Person-Years:

$102,000, 1/2 person-year.

8. Estimated Number and Frequency of Committee Meetings:

The Panel will meet approximately four times a year, approximately every three months, as necessary.

9. Committee's Termination Date (if less than two years from the date of establishment or renewal):

Not applicable.

10. Subcommittee(s):

To facilitate the functioning of the Panel, subpanels may be formed. The objectives of the subpanels are to make recommendations to the parent panel with respect to particular matters concerning plans and programs which are related to the responsibilities of the parent panel.

11. Members:

a. Panel members shall be appointed by the Secretary of Energy.

b. Approximate number of Panel members: 17

c. Membership term will be up to three years for members other than the Chairperson.

12. Chairperson:

The Chairperson shall be appointed by the Secretary of Energy. Term of the Chairperson may exceed three years.

Charter for the Advisory Committee named above is hereby approved on:

JAN 12 1995

Date

Jo Anne Whitman

Marcia L. Morris
Advisory Committee Management Officer

JAN 12 1995

Date Filed

DEPARTMENT OF ENERGY
CHARTER
HYDROGEN TECHNICAL ADVISORY PANEL

1. Panel's Official Designation:

   Hydrogen Technical Advisory Panel (the "Panel")

2. Panel's Objectives and Scope of Activities and Duties:

   The Panel will advise the Secretary of Energy on the program authorized by "Spark M. Matsunaga Hydrogen Research, Development, and Demonstration Act of 1990," Public Law 101-566.

   The Panel will advise and make any necessary recommendations to the Secretary on the following items: (1) the implementation and conduct of programs required by the Act; (2) the economic, technological, and environmental consequences of the deployment of hydrogen production and use systems; and (3) the contents of the comprehensive five-year program plan required by the Act.

3. Time Period Necessary for the Panel to Carry out its Purpose:

   The Panel's activities and duties, as set forth in section 108 of the Act, are expected to be continuing in nature.

4. Official to Whom This Panel Reports:

   The Panel will report to the Secretary through the Assistant Secretary for Energy Efficiency and Renewable Energy.

5. Agency Responsible for Providing Necessary Support for This Panel:

   The responsible agency is the Department of Energy. The primary support will be provided by the Assistant Secretary for Energy Efficiency and Renewable Energy.

6. A Description of Duties For Which The Panel Is Responsible:

   The duties of the Panel are solely advisory and are stated in Paragraph 2 above.

7. Estimated Annual Operating Costs in Dollars and Person-Years:

It is estimated that the Panel's annual operating costs will be $100,000 or less, including 1/3 person-year for support.

8. Estimated Number and Frequency of Panel Meetings:

The Panel is expected to meet once or twice each year.

9. Panel's Termination Date (If less than two years from the date of establishment or renewal):

Not applicable.

10. Subcommittees:

The Panel will form subcommittees as it deems necessary.

11. Members:

The Secretary will appoint the Panel members. The Panel will consist of 12 members and will be comprised of individuals selected from domestic industry, universities, professional societies, Government laboratories, financial, environmental, and other organizations. Panel members will serve for a term not to exceed three years and may be reappointed for a successive term. One-third of the membership will be subject to appointment each year.

12. Chairman:

The Chairman shall be elected by the Panel members from among their number and will serve for a period of two years according to section 108 of the Act.

This Charter for the Advisory Panel named above is hereby approved on:

7/3/93
Date

Marcia L. Morris
Advisory Committee Management Officer

Date Filed: JUL 28 1993

DEPARTMENT OF ENERGY

CHARTER

Inertial Confinement Fusion Advisory Committee/ Defense Programs

1. Committee's Official Designation:

Inertial Confinement Fusion Advisory Committee/Defense Programs (ICFAC/DP)

2. Committee's Objectives and Scope of Activities:

The Inertial Confinement Fusion Advisory Committee provides advice and guidance to the Assistant Secretary for Defense Programs on both technical and management aspects of the inertial confinement fusion program. Through periodic review of the program, the Committee provides:

a. Recommendations of any changes considered desirable on the basis of scientific and technological advances or other factors;

b. Advice on the efficacy of long-range plans, priorities, and strategies in using available and anticipated resources, addressing risks, and demonstrating the feasibility of inertial confinement fusion;

c. Advice on appropriate pace and scope of the program for achieving program objectives; and

d. Advice and guidance on any issues relating to the program as requested by the Assistant Secretary for Defense Programs.

3. Time Period Necessary for the Committee to Carry Out its Purpose:

Because of its long-range objectives and broad scope, the Committee is necessarily expected to be continuing in nature.

4. Official to Whom this Committee Reports:

The Committee will report to the Assistant Secretary for Defense Programs.

5. Agency Responsible for Providing Necessary Support for this Committee:

The Department of Energy (DOE). Within DOE, primary support shall be furnished by the Office of Inertial Confinement Fusion, DP-28.

6. Description of Duties for which the Committee is Responsible:

The duties of the Committee are solely advisory and are stated in paragraph 2 above.

7. Estimated Operating Cost in Dollars and Person Years:

$50,000; 1/3 person year.

8. Estimated Number and Frequency of Committee Meetings:

The Committee will meet approximately 3 times a year and at least once every 6 months.

9. Committee's Termination Date (If Less Than 2 Years from the Date of Establishment or Renewal):

Not applicable.

10. Subcommittees:

At the discretion of the Committee chairperson and with the concurrence of the Executive Director (Designated Federal Officer), subcommittees may be formed to gather data, conduct analyses, and develop draft recommendations for the parent committee with respect to particular matters concerning plans and programs that are related to the responsibilities of the parent committee.

11. Members:

a. Committee members shall be appointed by the Secretary of Energy.

b. The Committee shall consist of approximately 15 members.

c. Term of Committee membership shall be 2 years.

Members may be appointed to succeeding 2-year terms following membership review unless terminated earlier. No Committee member may serve more than three consecutive 2-year terms.

12. Chairperson:

The chairperson shall be designated by the Secretary of Energy.

This charter for the advisory committee named above is hereby approved on:

APR 13 1994

Date

Marcia L. Morris

Howard H. Raiken
Advisory Committee Management Officer

APR 13 1994

Date Filed

DEPARTMENT OF ENERGY

CHARTER

METAL CASTING INDUSTRIAL ADVISORY BOARD

1. Board's Official Designation:

Metal Casting Industrial Advisory Board

2. Board's Objectives and Scope of Activities and Duties:

The Metal Casting Industrial Advisory Board will advise the Secretary of Energy on the implementation of the Metal Casting Competitiveness Research Program, including the selection criteria of its competitive solicitations for research proposals, guidance in the operation of the program, and other advice which will enhance the effectiveness in achieving the objectives of the Department of Energy Metal Casting Competitiveness Research Act of 1990 (Public Law 101-425, 15 U.S.C. 5301-5309) (the Act) enacted on October 15, 1990.

On an annual basis, the Board will also review the Secretary's competitive solicitations and selection of research proposals and make recommendations as to how each such activity can be altered so as to better achieve the purposes of the Act; and review the research activities of each selected applicant, and the selected applicant's management plan, and report its findings and recommendations to the Secretary. At that time, the Board will also review the Program's progress and provide guidance to the Secretary with respect to improvements which will assist the Secretary in meeting the needs and priorities of the United States metal casting industry as envisioned by the Act.

3. Time Period Necessary for the Board to Carry Out Its Purpose:

The Board's responsibilities, as set forth in Section 7 of the Act, are expected to be continuing in nature.

4. Official to Whom This Board Reports:

The Board will report to the Secretary through the Assistant Secretary, Energy Efficiency and Renewable Energy.

5. Agency Responsible for Providing Necessary Support for This Board:

Department of Energy. Primary support will be provided by the Office of the Assistant Secretary for Energy Efficiency and Renewable Energy.

6. A Description of Duties for Which the Board is Responsible:

The duties of the Board are solely advisory and are fully stated in paragraph 2 above.

7. Estimated Annual Operating Costs in Dollars and Person Years:

It is estimated that the Board's activities will require $85,000 annually, and will need 1/2 person year.

8. Estimated Number and Frequency of Board Meetings:

As a result of the increased number of National Metal Casting Research Institutes established as a result of the first solicitation for proposals and the interest in this program expressed by the various sectors of the metal casting industry and their customers, i.e. the user-industries, it is anticipated that the Board will meet two or three times a year. In addition, several sub-committees are expected to meet twice a year with working groups composed of representatives of the user-industries, researchers, and metal casting experts.

9. Board's Termination Date (If less than 2 years from the Date of Establishment or Renewal);

Not applicable.

10 Subcommittees:

Subcommittees shall be formed as the Board deems necessary.

11. Members:

A. Board members shall be appointed by the Secretary of Energy. A majority of the Board shall be individuals from the metal casting industry or individuals affiliated with the industry. At least one member of the Board shall be chosen from each of the four census regions of the country. Each Board member shall serve for a term not to exceed five years, but may be reappointed for successive terms. Not more than one third of the membership shall be subject to renewal each year.

B. Number of members: 9.

12. The Chairperson shall be designated by the Secretary of Energy and shall serve for a period of 2 years.

This Charter for the Advisory Board named above is hereby approved on:

DEC 3 0 1993
Date

Marcia L. Morris
for Howard H. Raiken
Advisory Committee Management Officer

Date Filed: DEC 3 0 1993

U.S. Department of Energy

CHARTER

NATIONAL ELECTRIC AND MAGNETIC FIELDS ADVISORY COMMITTEE

1. Legislative Authority and Committee's Official Designation:

The Energy Policy Act of 1992 (the "Act") directed the establishment of the National Electric and Magnetic Fields Advisory Committee (the "Committee") by the Secretary of Energy and the Secretary of Health and Human Services.

2. Committee's Objectives and Scope of Activities and Duties:

The Committee will make recommendations to the Interagency Committee with respect to the duties of the Interagency Committee under section 2118(d)(1) of the Act and will advise the Secretary of Energy and the Director of the National Institute of Environmental Health Sciences with respect to the design and implementation of the Program, including preparation of solicitations for proposals to conduct research under the program.

The Committee will review reports that summarize activities and their results from individuals who conduct activities under the Program. The Committee will review National Academy of Sciences reports that evaluate the research activities under the Program. The Committee will provide advice to the Interagency Committee on legislatively mandated reports to the Secretary of Energy and the U.S. Congress.

3. Time Period Necessary for the Committee to Carry Out its Purpose:

The Committee's duties and activities, as set forth in section 2118(e) of the Act, are expected to continue until December 31, 1997.

4. Official to Whom this Committee Reports:

The Committee will report to the Secretary of Energy and to the Director of the National Institute of Environmental Health Sciences.

5. Agency Responsible for Providing Necessary Support for this Committee:

The responsible agency is the Department of Energy.

6. A Description of Duties for Which the Committee is Responsible:

The duties of the Committee are solely advisory and are stated in Paragraph 2 above.

7. Estimated Annual operating Costs in Dollars and Person-Years:

   It is estimated that the Committee's annual operating costs will be $150,000 or less, including one-third person-year for support.

8. Estimated Number and Frequency of Committee Meetings:

   The Committee is expected to meet at least twice each year.

9. Committee's Termination Date:

   The Committee will terminate not later than December 31, 1997.

10. Subcommittees:

    The Committee will form subcommittees as it deems necessary.

11. Members:

    As set forth in section 2118(e)(3) of the Act, the Committee will have 10 members. Five of these members will be appointed by the Secretary of Energy and five members will be chosen by the Secretary of Health and Human Services in consultation with the Director of the National Institute of Environmental Health Sciences. Members will be chosen from among experts in possible human health effects of exposure to electric and magnetic fields, experts in the measurement and characterization of electric and magnetic fields, experts in the assessment and management of electric and magnetic fields, State regulatory agencies, State health agencies, electric utilities, electrical equipment manufacturers, labor unions and the public.

12. Chairman:

    The Chairman will be elected by the Committee members from among their number. The Chairman will serve for a period of two years.

This Charter for the Advisory Committee named above is hereby approved on:

Whitman
Advisory Committee Management Officer

Date Filed: MAR 0 9 1995

American Statistical Association
Committee on Energy Statistics

Member Name / Address / Phone Number

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1995 MEMBERSHIP

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- Co-founder of Pacific International Center for High Technology Research

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Hydrogen Technical Advisory Panel
Subcommittees

Formed at September 1994 Meeting

- **Integration Committee**
  Chairman - James MacKenzie
- **Demonstration Committee**
  Chairman - Alan Lloyd
- **Sustainable Energy R&D Center Committee**
  Chairman - David Nahmias
- **Budget and Structure Committee**
  Chairman - Patrick Takahashi
- **Technology Requirements for Applications Committee**
  Chairman - Mounir Kamal

INERTIAL CONFINEMENT FUSION ADVISORY COMMITTEE (ICFAC/DP)

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August 25, 1993

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Chairwoman, Board of Directors
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Dr. R. Bruce Miller
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Dr. Marshall N. Rosenbluth
Professor, Department of Physics
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Dr. William W. Simmons
Independent Consultant

Inertial Confinement Fusion Advisory Committee (ICFAC)/Defense Programs

Subcommittees*

Pulsed Power Subcommittee met 3/8/93

Dr. Marshall Rosenbluth (Chair)
Dr. David Hammer
Dr. Arthur Kerman
Dr. R. Bruce Miller

Target Physics Subcommittee met 10/28 - 10/29/93 and 12/15 - 12/16/93

Dr. Steven Koonin (Chair)
Dr. J. Richard Airey
Dr. David Hammer
Dr. Arthur Kerman
Dr. Marshall Rosenbluth

Laser Subcommittee met 4/20 - 4/21/94

Dr. William Simmons
Dr. J. Richard Airey
Dr. Anthony DeMaria

*These subcommittees were identified by the ICFAC Chairman to address specific charges, and are not viewed as standing subcommittees.

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Congress of Industrial Organizations

Ms. Shirley D. Linde
Citizens for Safer Electromagnetic Fields

Dr. James A. Melius
School of Public Health
State University of New York

ADVISORY COMMITTEES	PROGRAM	FUNDING SOURCE Appropriation
American Statistical Association Committee on Energy Statistics	Energy Information Administration	Energy Information Administration
Basic Energy Sciences Advisory Committee	Energy Research	Energy Supply R&D, Basic Energy Sciences
Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Restoration and Waste Management	Environmental Management	Defense Environmental Management
Fusion Energy Advisory Committee	Energy Research	Energy Supply R&D, Fusion
Health & Environmental Advisory Committee	Energy Research	Energy Supply R&D, Biological & Environmental Research
High Energy Physics Advisory Panel	Energy Research	General Science & Research, High Energy Physics
Hydrogen Technical Advisory Panel	Energy Efficiency and Renewable Energy	Energy Supply R&D, Hydrogen Research
Inertial Confinement Fusion Advisory Committee/Defense Programs	Defense Programs	Weapons Activities, R&D
Metal Casting Industrial Advisory Board	Energy Efficiency and Renewable Energy	Energy Conservation, Industry Sector
National Electric and Magnetic Fields Advisory Committee	Energy Efficiency and Renewable Energy	Energy Supply R&D, Electric Energy Systems

BUDGET INFORMATION FOR ADVISORY COMMITTEES

FEDERAL ADVISORY COMMITTEES	SITE LOCATION	ACTUAL EXPENDITURES	PROJECTED COSTS	BUDGET REQUEST
		---- (Whole Dollars) ----		
		FY 1994	FY 1995	FY 1996 *
American Statistical Association Committee on Energy Statistics	Washington, D.C.	58,191	62,200	64,066
Basic Energy Sciences Advisory Committee	Washington, D.C.	299,000	358,000	368,740
Federal Advisory Committee to Develop On-Site Innovative Technologies for Environmental Restoration and Waste Management	Washington, D.C.	894,707	1,108,641	1,141,900
Fusion Energy Advisory Committee	Washington, D.C.	10,000	154,000	158,620
Health and Environmental Research Advisory Committee	Washington, D.C.	117,250	125,000	128,750
High Energy Physics Advisory Panel	Washington, D.C.	97,800	99,600	102,588
Hydrogen Technical Advisory Panel	Washington, D.C.	70,137	70,337	72,447
Inertial Confinement Fusion Advisory Committee/Defense Programs	Washington, D.C.	217,508	169,300	174,379
Metal Casting Industrial Advisory Board	Washington, D.C.	87,523	113,000	116,390
National Electric and Magnetic Fields Advisory Committee	Washington, D.C.	142,869	149,000	153,470
TOTAL		1,994,985	2,409,078	2,481,350

* FY 1996 Budget Request column reflects FY 1995 anticipated costs adjusted upward for inflation for all advisory committees, except the Environmental Management Site Specific Advisory Board.

QUESTION FROM REPRESENTATIVE ROHRABACHER

Question 32:	On page 14 of the Attachment, it is stated that "[t]he recommendation will be fully implemented by the imminent issuance of criteria for partnership formation." Please provide a copy of these partnership criteria for the hearing record.
Answer:	Attached is a copy of the criteria, which were issued in final form on March 31, 1995.

U.S. DEPARTMENT OF ENERGY
PARTNERSHIP CRITERIA

Objective

The Department's technology partnerships will provide value to the taxpayer by supporting our missions and yielding economic and other benefits to the Nation.

Principles

When entering into partnerships, the Department will adhere to the following principles:

- All partnerships using taxpayer funds will support departmental missions.
- All partnerships will have the potential to yield economic and other benefits to the nation.
- Measurement and accountability standards will be established for all partnerships.
- Partnerships will be formed in a fair and open manner.
- Best business practices will be used during the formation and management of partnerships.

Criteria

Technology partnerships that require a joint investment of program and private sector funds and/or capabilities shall be responsive to the following criteria:

A. Department of Energy Mission Objectives

- Direct Benefit How well does a partnership contribute toward accomplishing a specific mission objective of the Department?
- Indirect Benefit: How well does a partnership maintain, develop, or strengthen a capability of the Department?
- Alignment with Administration Policy: Does the partnership contribute to Administration objectives as outlined in the Administration's technology policy statements or other guidance documents?

B. Economic & Other National Benefits

- Economic Productivity: Will a partnership contribute to U.S. economic growth?

Other National Benefits: Does the partnership improve the environment, health and safety, national security or another national requirement?

C. Measurement & Accountability

- Evaluation: Are there clear and reasonable performance measures identified for a partnership? Has an evaluation and review process been established that incorporates the performance measures?

- Impact: How significant is the impact on the company or an industrial sector (as defined by such measures as increased U.S. share of world market, creation of quality jobs, reduced cost of manufacture, reduced energy consumption, or better balance of trade)? Does the partnership strengthen an integrated R&D system that includes industry, academia, and the federal government?

D. Fairness of Opportunity

- Fairness of Opportunity: Has a reasonable attempt been made to communicate to all potential participants the partnership opportunity? Is there a sufficient level of participation by the industry?

- Diversity: Has a reasonable attempt been made to address diversity considerations in partnership opportunities.

E. Business Practices

- Readiness: Has the partner developed both a credible plan/roadmap for its future, and a strong and a demonstrated ability to carry it out? Is there an organization that could serve as a coordinating body for the partnership and can bind participants to the terms of the agreement?

- Support of Goals: Are the Department's resources sufficient to support the partnership goals? Are a partnership's research sharing and cost sharing arrangements appropriate?

- Management: Is a partnership plan satisfactory (including as appropriate: departmental leadership, laboratory/facility leadership, industry leadership, managerial structure, objectives and milestones, legal aspects, communications, and administrative matters)?

- Leveraging Facility/Resources: How well does the partnership leverage departmental resources? Are there other federal agencies whose activities would benefit from the partnership and are those agencies willing to participate in a meaningful way to achieve the partnership's goals?

Robert W. Galvin
Chairman of the
Executive Committee

April 4, 1995

The Honorable Steve Schiff
Chairman Basic Research Subcommittee
The Honorable Dana Rohrabacher
Chairman Energy & Environment Subcommittee
c/o Mason Wiggins
Committee on Science
B-374 Rayburn House Office Building
U.S. House of Representatives
Washington, DC 20515

Dear Congressmen Schiff and Rohrabacher:

I am pleased to respond to the questions you submitted in your letter of March 16.

You will note that I am using the format of repeating back to you each page of questions and then I follow that with my answer which is addressed by page number and bullet number of the questions involved.

Best wishes,

Robert W. Galvin

RWG:ch

Motorola Inc., Corporate Offices
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carrie 703-355-3253 fax

PAGE I

QUESTIONS FROM MR. GEREN AND MR. BROWN
FOR DR. GALVIN
FOLLOWING THE HEARING ON
THE DEPARTMENT OF ENERGY NATIONAL LABORATORIES

1. • Your report suggests that the laboratories are overstaffed and that significant FTE reductions could be made by changing the management relationship between the Department and the Laboratories and by focusing the Laboratories more closely to core DOE missions. Do you have an estimate of the size of FTE reductions that you would expect from changes in management and from a narrowing of the missions of the laboratories?

2. • Your report recommends that many of the defense research functions of Livermore could be transferred to Sandia or Los Alamos Laboratories, and that Livermore could focus instead on non-proliferation activities. What would a revamped Livermore Laboratory look like in your thinking? Would it be as large as it is now?

3. • Does the construction of the National Ignition Facility at Livermore Lab make sense if the Department transfers weapons research activities out of Livermore?

4. • The Task Force claimed that it could not look at questions concerning the consolidation of facilities or closure of laboratories because the Task Force did not contain the appropriate members. What would be the appropriate membership for a Task Force looking at the consolidation or closure of facilities and/or laboratories?

PAGE II

QUESTIONS SUBMITTED BY
REPRESENTATIVE BILL BAKER OF CALIFORNIA
FOR DR. GALVIN
REGARDING HIS TESTIMONY AT THE
BASIC RESEARCH, ENERGY & ENVIRONMENT SUBCOMMITTEES
JOINT HEARING ON NATIONAL LABORATORIES' FUTURES

1. - Mr. Galvin, your task force considered many cost-saving measures for the national labs, but I understand it ultimately supported the building of the National Ignition Facility, or NIF. Am I correct?

2. - How strong was the support for the NIF on your task force?

3. - Under the unique structure of a "corporatized" laboratory system, who would provide oversight of the labs? Would this merely add another layer of micro-managing bureaucracy?

4. - Regarding potential cost savings, in your task force recommendations you mention that in private industry it is axiomatic that a like reorganization would generate better than 20 percent cost improvements (page 57). Can you offer a comparable private sector reorganization model to represent "corporatization" changes you recommend the national labs undertake that have yielded 20 percent cost improvements? If there is no comparable model, how close to accurate would you say the 20 percent cost savings axiom is for the labs, under your task force's recommendations?

ANSWERS TO QUESTIONS ON PAGE I

1. We were not staffed to estimate the size of FTE reductions but I believe it is safe to say that in the larger laboratories, this could number in the few hundreds and the smaller laboratories possibly up to 100 administrative people if the laboratories were freed of the micromanaging syndrome. It is possible to consider some professional staff reduction if, as a function of better mission definition, better determination by the defining of roadmaps, one could identify some redundancies that the virtual system of laboratories would allow for the modest reduction in force.

2. The changes we recommend at Lawrence Livermore would be evolutionary. We would imagine that there would be a hundred or so people that would be affected by this move, some large handful of which would possibly be moved to either Los Alamos or to Sandia. There would likely be some attrition but the balance of the laboratory as we see it would remain vital and active and would not, unless by prescription, be a significantly reduced size laboratory. You did take note of the fact that we are encouraging the continuation of the NIF and that work will be of some modest expanded nature.

3. The facilitating of the National Ignition Facility does make sense at Livermore. The cadre of scientists are eminently capable of employing this tool for fundamental science purposes as well as the related work that they can continue to do in support of the other two defense labs. Our subcommittee spent a great deal of time analyzing this aspect of the recommendation and felt that Livermore was an excellent site for this ongoing tool for American science.

4. The Task Force did not feel competent within the time limit that it had to analyze loadings and financial consequences and political consequences of closures of laboratories. But I would suggest that the composition of the Task Force was of the nature that could readily deal with this issue if that was the assigned responsibility. Were that to be the case then I think there would be one other complementary set of resources obliged and that would be a very substantial staffing by government services such as the Office of Management and Budget or GAO to provide the detailed information that would compliment the kind of data that would be forthcoming from the laboratories themselves. The nature of responsibilities dealing with closure is far different than our dealing with the issue of the future roles of the laboratories in an active mode.

ANSWERS TO QUESTIONS ON PAGE II

1. Yes, we do support the facilitating of the National Ignition Facility. This was a substantially studied subject. We recognize many different points of view but after full deliberation we came down in favor of this important project.

2. I consider the support strong. Clearly much better than a majority of the group was for the proposal and because it was focused on so thoroughly, when the answer came out on the positive side I considered that that is a thoughtful and significant support.

3. The oversight of the labs would be the responsibility of the Board of Trustees. We purposely used the term "trustee" meaning "trusting" people. People of the quality of the David Packards who would be recruited to serve on this distinguished board and setting up a whole new modus operandi for Federal operation would be the noblest of people to see to the high standards of operation of the laboratories. This would not be just another layer of micromanaging. All other layers would be eliminated. The Board would be the conscience of, Standard Setter, Policy Definer which "get out of the way" of the professionals so they could get the job done. In fact, these kinds of trustees would not manage. They would see to the accomplishment of the highest principles of conduct and professional accomplishment.

4. There has been no need in corporations to move from something that was the Federal norm to the private sector norm but let us just take a company like Motorola that changed within itself. When we were operating our company back in the 70s at what we thought was an effective and efficient level of operation and were competitive around the world, we had a given standard of cost performance. As soon as we opened ourselves to the new quality management principles, which we now think could be embraced by the laboratories and would only be fully embraced if they were allowed to be freed of the Federal norm, we automatically improved the quality of our designs, the quality of laboratory performance, the quality of our administrative performances and in Motorola's case, also the quality and cost of manufacturing. Routinely, with very hard work we saved a minimum of 20 percent of our costs of operations. So there are all manners of models in the private sector that demonstrate that these kinds of cost savings are accomplishable. As a matter of fact in the private sector where we were not encumbered to begin with with the Federal norm, today almost all major efforts that we embark on we embark on with an intention of attempting to further improve the productivity 50 percent or double or triple our current efficiencies. That's what's accomplishable when you are freed from the Federal norm and apply high quality management systems.

PAGE III (a)

COMMITTEE ON SCIENCE

SUBCOMMITTEE ON BASIC RESEARCH
AND
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

JOINT HEARING
ON
Alternative Futures for the Department of Energy National Laboratories
("The Galvin Report")
and
National Laboratories Need Clearer Missions and Better Management
(a GAO Report to the Secretary of Energy)

March 9, 1995

Followup Questions Submitted by Mr. Rohrabacher to

Mr. Robert Galvin
Chairman
Chairman, Task Force on Alternative Futures
for the Department of Energy National Laboratories

1. At the bottom of page 1 of the Task Force's report (Report), it is stated that "we do feel justified in asserting that the energy agenda which we will profile in this report does require central, federal, senior cognizance and appropriate government sponsorship in the interest of the short-term and long-term overall quality of life in America and the world."

   Many would argue that on the contrary, excessive and misguided command-and-control federal intervention in the energy markets (e.g., price controls, fuel allocation schemes, import quotas, excessive regulations, etc.) were largely responsible for the energy crises of the 1970's, and that free markets can do a much better job.

   Given this counterargument, why did the Task Force "feel justified in asserting that the energy agenda which we will profile in this report does require central, federal, senior cognizance and appropriate government sponsorship in the interest of the short-term and long-term overall quality of life in America and the world"?

2. On page 2 of the Report, it is stated that "the word energy . . . gives focus and gives a wide-ranging field of relevant explorations." However, the very definition of the work "energy" (i.e., the capacity to do work) is so broad that a myriad of diverse activities can be justified under this rubric. That being the case, how can an "energy" mission provide focus?

PAGE III (b)

3. On page 4 of the Report, it is stated that "[w]e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist." What, in your view, is "an appropriate division of labor" and where are we currently out-of-balance?

4. On page 5 of the Report, it is stated that "[t]he existing budget of the national laboratory system exceeds that required to perform its agenda in the areas of national security, energy, environment, and fundamental science." What, in your opinion, is the amount of excess budget, and are there only excesses in the national security mission, or in other missions as well?

5. On page 6 of the Report, it is stated that "[t]he primary mission for the laboratories in relation to energy technologies is to pursue a research and technology development agenda which enhances the long-term prospects for adequate energy supplies and efficient end use technologies which minimize adverse environmental impacts. The primary role for the laboratories should be in areas where long-term research holds the prospect for significant payoffs, and where a clear public purpose is being served through Federal support. To the maximum extent possible, energy R&D at the laboratories should be coordinated with the private sector and be guided by technology road maps."

   a. What do you mean by "long-term" in this context?

   b. How do we define when "a clear public purpose is being served through Federal support"?

   c. Would you please elaborate what you mean by the term "technology roadmaps"?

6. On page 7 of the Report, it is stated that "[c]ollaborations between the national laboratories and the private sector serve the important function of providing dual benefits to the partners, but such collaborations generally should be closely aligned with core mission areas of the Department. To the extent appropriate, such collaborations should be cost-shared and tied to technology road maps developed by and with industrial sectors."

   What do you believe is an appropriate amount of cost-sharing?

7. On page 15 of the Report, it is stated that "[t]he Task Force believes that the development of independent assessment of the safety and reliability issues within an aging stockpile will be an ongoing requirement of stockpile stewardship. It also believes, however, that there are many ways in which this peer review function can be served, and that peer review, in and of itself, does not justify the existence of two nuclear design laboratories."

   a. What are some of the "many ways in which this peer review function can be served"?

   b. Given that the two nuclear design laboratories—Los Alamos National Laboratory (LANL) and lawrence Livermore National Laboratory—have the same operating contractor (i.e., the University of California), how can truly independent assessment be achieved under the current circumstances? Is there not already the appearance of a conflict of interest?

8. Also, on page 15 of the Report, it appears that the Task Force endorsed *in toto* the major research facilities' recommendations of the August 10, 1994, Jason Stewardship report entitled *Science Based Stockpile Stewardship.* Is this indeed the case?

9. The Task Force endorsed "[p]roceeding with the National Ignition Facility (NIF), prioritized with respect to other major research investments", but questioned whether or not the NIF should be built at Lawrence Livermore National Laboratory (LLNL).

   a. With regard to priority of the NIF, what was the Task Force's position? Should it be of high-priority, medium-priority, or low-priority?

   b. What are the pros and cons of building the NIF at LLNL?

10. On page 19 of the Report, it is stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences)."

    Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?

11. On page 20 of the Report, it is stated that "[t]he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D. The Task Force was divided concerning a recommendation for the level of support needed in the area of fusion energy."

    a. What is the difference between "energy efficiency" and "conservation"?

    b. Given that light water reactor technologies are mature, what are specific examples of nuclear fission-related R&D activities that the laboratories should continue to pursue?

    c. Could you please elaborate on the Task Force's differences "concerning a recommendation for the level of support needed in the area of fusion energy"?

12. On page 21 of the Report, it is stated that "[t]he Department currently has several major collaborations in place with the Gas Research Institute, Electric Power Research Institute, fossil fuel extraction companies, and energy-intensive industrial sectors, such as the pulp and paper industry. The Task Force commends these efforts, which help guide appropriate areas of government vs. private sector R&D, and help ensure eventual commercialization of new technologies and processes."

    However, if one examines many of these collaborations in any detail, it is apparent that many are focused on short-term, low-risk, specific product developments. Does the Task Force endorse these types of collaborations as an appropriate Federal role, and if so, what would the Task Force consider an outright and inappropriate government subsidy?

13. On page 21 of the Report, it is also stated that "the Department must be careful to ensure that, while working closely with energy producers and users, its energy R&D program is not captured or dominated by short-term interests, since the most appropriate areas for laboratory investment using public funds will be in areas which address long-term uncertainties and needs."

    How can the Department ensure that capture or dominance by short-term interests does not occur?

14. On page 23 of the Report, the Task Force encourages the Department "to establish an Industrial Ecology Advisory Board, including members from the laboratories, state, private industry, public interest groups and other government agencies."

    Given the numerous advisory bodies within the Department and given the Task Force's admonitions against micro-management and more bureaucracy, why should yet another advisory board be established?

15. The Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions. Could you please give one or two examples of what you consider an appropriate mission statement for one of the Department's multi-program laboratories?

16. On page 25 of the Report, it is stated that "to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."

    Could you please provide some specific examples of this "spreading the wealth" phenomenon"?

17. On page 31 of the Report, it is stated that "[t]echnologies are being developed independent of field and site needs that are subsequently not field implemented because of a lack of customer interest or involvement or because they replicate work done elsewhere."

    Could you please provide some specific examples of these technologies that are currently being developed?

18. On page 33 of the Report, it is stated that "technology known to senior scientists and engineers both in the national laboratories and in the country's universities is in the wings that, appropriately applied, could dramatically alter the current prospects [for the EM program]."

    Could you please provide some specific examples of these technologies?

19. On page 35 of the Report, it is stated that "[t]he Department . . . will . . . have to consider reducing its cost-recovery fees levied on all Work for Others. These fees now signal that contributions to the tasks faced by other agencies of government are not a high priority with the Department."

    What is the level of these fees, and what is your understanding of DOE's rationale for setting these fees?

PAGE III (f)

20. On page 36 of the Report, it is stated that "*[c]losing the science/engineering - applications disconnect should be dealt with by the establishment of an 'Environmental Advisory Board (EAB),' reporting to the Under Secretary.*"

    As in question 14 above, given the numerous advisory bodies within the Department and given the Task Force's admonitions against micro-management and more bureaucracy, why should yet another advisory board be established?

21. On page 37 of the Report, the Task Force states that "an increment of $400 million annually for the laboratories with a ramp-up over time to twice that sum is roughly the scale needed to pursue research and development in an improved [EM] program."

    What is the analytical bases of support for this recommendation?

22. On page 40 of the Report, reference is made to "a decline in the status of basic science within DOE."

    a. What is meant by this statement?

    b. What are the specific manifestations of the "decline in the status of basic science within DOE"?

    c. When did this decline in status begin, and what are the factors causing such a decline?

23. On page 41 of the Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas"?

    What specific research areas have suffered a loss of vitality?

24. On page 43 of the Report, the Task Force recommends "that DOE set aside small pools of basic research funds in the different programmatic areas for which university and laboratory researchers would compete."

    What specific size of "small pools" does the Task Force recommend?

25. On page 43 of the Report, it is also stated "[b]arriers that make it difficult for the laboratories to jointly fund research at universities with other funding sources should be removed."

    What specific barriers exist?

26. On page 45 of the Report, it is stated that "[t]here are only a relatively few instances in which the laboratories have technology that is vital to industry and that is uniquely available at the laboratories."

    Please provide some specific examples of these technologies.

27. On page 49 of the Report, it is stated that "[w]e are further concerned about the possibility that DOE and its laboratories, in engaging in industrial R&D, may find themselves competing with private firms in providing technical services or new technological developments. In such a situation, the laboratories' access to public funds would give them an inappropriate advantage. Such situations are more likely to arise the less DOE and laboratory management know about the commercial application in question. We are already aware of some instances in which such competition appears to have occurred, and we are concerned that the problem may become more serious in the future."

    Please provide some specific examples of "instances in which such competition appears to have occurred."

28. On page 49 of the Report, it is also stated that "[t]he current industrial partnership activities of the laboratories have brought them into contact with a number of industries that do not lie within the Department of Energy's traditional domain. In addition to the drawbacks specified above, these new involvements also suffer from a number of other problems:

    - They are unfocused. Without a connection to the Department's larger public missions, these initiatives are invariably add-on activities, managed on a case-by-case basis, through a well-intentioned but necessarily ad hoc relation to industry. The laboratories should not aspire to become research boutiques for industries.

    - Their short-term benefits are often oversold. Even when useful results flow from these partnerships, the benefits to the participating firms generally will not be evident for some time, and are inherently difficult to measure.

    - They distract the DOE and its laboratories from their public missions, diverting both intellectual and material resources."

    a. Please list the specific partnership activities referred to in above statement.

    b. Does the above statement apply to the AMTEX Partnership, and if not, why not?

c. Does the above statement apply to the Partnership for a New Generation of Vehicles (PNGV), and if not, why not?

29. On page 53 of the Report, it is stated that "[g]overnment ownership and operation of these laboratories does not work well" and on page 54 of the Report, it is stated that "[i]t is the Task Force's position that top-down, command and control bureaucracies are counterproductive for these laboratories."

 a. Is it the Task Force's position that these statements apply to all Government-owned laboratories, including NASA's, DOD's, etc.?

 b. If the answer to a. above is yes, does the Task Force recommend "corporatizing" all Government-owned laboratories?

 c. Alternatively, if the answer to a. above is no, what is so unique about these ten DOE laboratories relative to the laboratories of other agencies, such as NASA and DOD?

30. What are the pros and cons of corporatizing the DOE weapons laboratories?

31. On page 56 of the Report, the Task Force recommends Congressional line item funding "in each of the four mission areas of national defense (if the weapons laboratories are included in the corporation), energy, basic research and environment; and another line item for other programs, a miscellaneous category including health, facility improvement, global ecology, economic betterment, etc. Each of those missions will contain funding that can be used across the full R&D spectrum from basic research to development and technology demonstration."

 If each of the mission area and the "other programs" line items "contain funding that can be used across the full R&D spectrum from basic research to development and technology demonstra-tion," what is the content of the "basic research" line item?

32. On page 56 of the Report, the Task Force also recommends that "[t]he budget should be for some multiple of years with our Task Force recommending that a decline be built into these funds over a five year period."

 a. What overall initial annual funding level does the Task Force believe appropriate?

 b. What does the Task Force believe to be the appropriate level of decline that should "be built into these funds over a five year period?

PAGE III (i)

33. On page 57 of the Report, it is stated that the Task Force's "recommendations of the type of substantial reorganization . . . could be expected to result in an improvement of between 20 and 50 percent in the effectiveness of the laboratories themselves, on top of significant staff and overhead economies in the Department."

    What is the size of the "significant staff and overhead economies in the Department" that the Task Force believes could be achieved?

34. What are the pros and cons of adopting the Task Force's "corporatized" recommendation versus adopting *in toto* the Appendix B (i.e. "If GOCO System Is Obliged") approach?

35. Does the Task Force believe that the "DOE Laboratory Board" to be chartered by the DOE by March 31, 1995, is an adequate substitute, at this time, for the corporate Board of Trustees recommended by the Task Force on pages 53 and 54 of the Report?

ANSWERS TO QUESTIONS ON PAGE III(a) - III(i)

1. The language we chose was purposeful but may have been too subtle. What we call for is Federal cognizance and sponsorship but we do not call for command and control of the subject matter. As you would have also noted we devote a great deal of our report to suggesting that the governance of the laboratories should be radically changed to a process that we call corporatization and is appropriately described in the report.

   The science base of the future energy needs of society are so broad and so deep that they are going to need a central focus on the part of the nation in order to accomplish the safe, affordable, clean, adequate energy that the world will need in the next 25-50 years. The Task Force could not identify any single private sector entity that could take this lead. But the private sector can have a leverage influence on the accomplishability of a well-determined roadmap for the development of the energy needs of the future, if the work is supported by the federal government but allowed to be affected and managed in a private sector way within the framework of a corporatization governance.

2. You are right. Our definition of energy is purposefully very broad. Within that breadth it is practical for people with the credentials to understand the basic sciences that relate to energy generation, use application, etc. to periodically define the roadmaps that would lead us to the earliest application of the most promising new ways and means accomplishable based on today's science knowledge. It would be a mistake not to leave open to the scientists' imagination all manner of possibilities that are unimaginable at this time. That is the essence of science, the discovery of something new.

   Yet, energy still has a perimeter to it and it will adequately limit the affairs of the laboratories to where they do not inadvertently go off on tangents that are not reasonably akin to the very broad and fundamental subject of energy.

3. It is hard to have an appropriate division if one has not attempted to define in broad terms what the roadmap should be. There has not been a coordinated effort between the credentialed researchers in the university as well as those from industry, in concert with those from the many laboratories. We are confident that if the representatives of these three entities along with whomever might be credentialed technologists in the government realm were to spend the kind of time that those of us in the semiconductor industry have put forth to come up with the semiconductor roadmap that it would then be possible for each to nominate themselves and iterate among themselves the appropriate division of efforts that would more optimally lead us to the desired results. As a matter of fact we do not know the degree to which we are out of balance because this matter has not been fully reviewed by those professionals who are hands on.

4. This requires a multipart answer. Based on what we surmised was the collection of assigned activities that the laboratories were given and/or had assumed, we felt that there were two opportunities for reduction in budget.

   1. Removing the micromanagement burdens would be a direct saving in the laboratories. Beyond that a gigantic saving in the budget of the Department of Energy's administration is accomplishable.

   2. The employment of better quality management systems which deal with the way in which laboratories could manage themselves (which assumes they are not micromanaged by the Department). It follows that we are confident that existing programs could be done more efficiently. We estimate in that regard that there could be something like a 20 percent savings (minimum). But you further ask the question are there excesses in the other missions beside national security. It is our estimation that as the better roadmaps are defined that those of you in federal service will acknowledge that there are other assignments that are of vital interest to our country that would be amendable or addable as responsibilities of the laboratories. You will find in our report four or five representations of where we think more work should be assigned and therefore the existing assignments would be added to.

   For example, we make the point that much better science must be yet achieved with regard to remediation and clean up. Only then will we be able to afford the actual clean up necessary. We can't the job done with today's science. So some more budget has to be applied to that subject.

   The National Security Mission can gradually diminish all in concert with what you people decide are the National Security policy needs and resourcing needs for our long-term peace keeping role.

5. By long-term we mean decades. Some of us informally discussed the potential that by the middle of the next century it was conceivable that the vast majority of the citizens of the world could have available at their fingertips the same amount of energy that you and I have now. If that is a reasonable possibility then there is a great deal of science that is going to have to help make this possible. We urge that you think in those terms because we cannot let a world meander into an ill-advised set of technologies that could be ruinous to our society while at the same time failing to make it possible for American interests to eventually have the right technology to project throughout the world for our economic gain which of course will eventually inure back through tax earnings to our government.

   The clear public purpose is generally alluded to in the statement above as distinguished from a miscellaneous group of ad-hoc reviews of a single company or a small industry outside of the energy industry wanting a technical answer to a near term problem.

In a prior question I refer to the semiconductor industry roadmap. Let me describe that briefly as a model. The entire semiconductor industry represented by, in our case, almost 200 senior engineering people from all walks of life in the industry, universities, etc. spent time over a couple of years ago (long weekends) and mapped out every conceivable step-by-step change that might be accomplished if engineering efforts were eventually resourced to affect future designs that were definable and/or guessable. These engineers knew that as sophisticated as they were able to project things out to say the year 2003 or 4 or 5 which would have given a 10 years roadmap, that in the course of their moving down that road they would find detours and/or later determined branches of the roads that they should follow. We have published that roadmap. We keep it up to date. The people in the government have access to it. The industry association coordinates entities within the industry and/or their allies such as university research programs and occasionally a project with one of the laboratories. But in our industry's case our corporate laboratories, mostly see to proceeding along that roadmap. We exchange information among ourselves. Yes, even among competitors on these precompetitive pieces of technology. As a consequence we're accelerating general knowledge that is fed back into each company's private laboratories to exploit the technology base into some practical product application.

Semiconductor is a broad science. It involves chemistry, mathematics, physics, circuit design, machinery design, etc. and we have gained confidence that any science subject can benefit from an extended definition of potentials and opportunities--a roadmap.

Since we in the Task Force started articulating this roadmap idea to the laboratories early on in our investigation, we have found an increased number of leaders in the laboratories acknowledging that this has promise. Personally, I have orchestrated such roadmaps in our company for over 25 years. We know how valuable they are in the realms that are within our competence and I am confident that our country could develop the culture of using roadmaps to a remarkable benefit.

6. Cost-sharing amounts probably would have to vary but personally, and I so stated this in the deliberations of our Task Force, I think that industry should share at least 50 percent of the costs of those identifiable joint projects.

7. Peers from academia, from the private sector and from other government labs are recruitable to serve the same function that would have primarily been done by the remainder team at Livermore. The appearance factor that you describe with regard to the University of California being the contractor for both Los Alamos and Livermore cannot be ignored. But it need not be a handicap if the GOCO system is retained (and we of course are advising that it ought to be changed to a different governance) it is my personal view that an entity of the quality of the University of California is quite trustable as not interfering with what could be varying opinions from objective scientists. I personally believe that the scientists of our laboratories are almost

universally trustworthy, they deal with the issues objectively and therefore we would not have the effect of a conflict of interest.

8. You ask if the appearance of endorsing in Toto the Jason Stewardship is the case. I can't check with anybody right now with regard to the in Toto part of your comment but I have discussed with members of the subcommittee on our Task Force who dealt with the subject for an substantial length of time that they took cognizance of the Jason Report. They were positively influenced by the Jason Report but I would speculate that there might have been some variance in our subcommittee's judgments as certain of the members of that subcommittee were also very sophisticated in this field. The Jason Report was an influence and it was seriously reviewed.

9. The Task Force came down on the side that the NIF should be built. It was at least as wise to build it at LLNL as any other place because it is a great base of people and facilities together. Being positive about continuing with NIF, it should be built expeditiously because it is a tool that will help both the quality assurances of our weapons as a consequence of our having a nonactive testing policy. It will be a major tool for fundamental physics research whose earlier availability would be of value.

10. You raise organizational questions, the details for which the Task Force did not go through an elaborate review. We took cognizance of the fact that there were these many stovepipes but we did not appraise the competence of any particular assistant secretary. In general, it was well implied by our recommendation that we move to corporatization and that the laboratories operate under a chief executive officer and attempt to work among themselves as a virtual system of laboratories that there would be no need for this class of stove piping of the organization. Personally it seems that your implied recommendation would make sense.

11. Energy efficiency refers to the efficiency with which the energy would be generated. Conservation involves the ability to operate energy driven devices with less energy. The two complement each other.

    I will separately have to prepare a somewhat expanded answer to your question as to what specific examples of other nuclear fission related R&D activities would be appropriate. But in anticipation that further answer, I am reminded that there was a promising fission-related R&D program proceeding at Argonne laboratories at the time we were making our first visits to that laboratory. We were subsequently informed that as a matter of general policy this project was stopped by the Department. The Task Force was not an advocate one way or another for this particular project but there was at least substantial commentary on the part of advocates at the laboratory working level that suggested that this particular Argonne project, which among other things, had the feature of consuming all of its fuel, was something that was very promising and was now going to be taken up and activated by the Japanese.

Our Task Force was populated by talented scientists and/or academicians who were well informed on nuclear energy subjects. Some members of our group felt that fusion energy had no potential for ever being practical. Others thought it would prove to be practical but it is so many decades into the future that until someone has discovered some new key idea that might make fusion promising on an earlier basis, that we should not spend money. There were others of us who felt that we could not afford not to pursue fusion on our technology roadmap. We just simply had a very broad spectrum of deep feelings on the subject. As a consequence it wasn't appropriate that we have described such a position.

12. You are correct that the class of activities with the outstanding entities like Gas Research Institute, EPRI, etc. have varying terms to their research programs. The judgment with regard to justifiable subsidy clearly becomes a matter of judgment. A few of these matters are absolute. As one experienced in selecting projects in the electronics field I see many instances where certain of the work that is an apparently short-term in nature within our focused subject matter very often helps lead to mid length and longer term development needs. The work that is does for mid length and longer term solves a concept that is appliable back to a shorter term goal. I think the important thing is to have the general subject matters accepted as the criteria and then secondarily apply the judgment as to whether or not it is necessary to devote some subsidy to a near-term solution which is of a sufficiently generic nature that the country should be involved in it so that the entire private sector can finally exploit that in the next couple of years.

    To the degree that it is segementable as to what things are being worked on that are very short-term in nature, it would seem that the governing bodies of these laboratories could have a rule of thumb that a well-determined limiting to a small percentage of the total budget should be applied to short-term affairs.

13. The references that you account for here are directed to all of you in the system. It's directed to the Congress so that no segment of the Congress would attempt to pork barrel a certain assignment in the interest of constituents, that the Department would not pursue its biases in the interest of a single entity or a short-term interest and of course in particular it's directed at the laboratories themselves. The first thing that we are doing therefore is, in effect, restating what we presume is an intended policy by able federal people already and we are simply setting up a warning that the governors of this institution, the Board of Trustees for example, would be the conscience of the institution and just watch to see that there is not a trend in the direction of favoring one company or one small section of our society unduly.

    When we started our project in early 1993 there was a liberal amount of talk going on around Washington that many people in the federal establishment were anxious that moneys be spent to create jobs in the next 6-12 months and it was in that vein that we felt we had to speak out as a restraining influence on this subject.

14. Your concern over adding entities is refreshing. The Task Force believed that if other of its recommendations were embraced, there could be incremental value without micromanagement effects by having a group of experts on industrial ecology to add the "roadmap type of focus" that was further outlined in the report. So to is that the case with the other remediation subject Board if the Department has some continuing sponsorship or customer relationship with laboratories, it would be assisted by more expert thinking of using only the most useful technology on remediation.

15. I will separately submit a later answer to this question. In anticipation of that let me describe one aspect of this issue that caused us to speak of the issue as we did.

    As we reviewed the mission statements of each of the laboratories we were struck by the fact that we could almost close our eyes as we listened and apply Lab A's mission rhetoric to Lab B. The similarities were remarkable. It was as if they were all out searching for the broadest statement of purpose in order to sweep up whatever may be the opportunities for continued service. It is possible that we will not find a truly appropriate mission statement in our judgment at this time that we believe would be reasonably distinctive compared to the others. Incidentally, distinctiveness could complement the other laboratories with their own distinctiveness. Thus one would have a virtual laboratory with de minimis redundancies except for some basic core competences that almost all laboratories must similarly possess.

16. I will be submitting a supplementary report that will be intended to provide the specific examples that you request. But the reference made in answer to question 15 is illustrative of the fact that the laboratories appeared to be sweeping the horizon in early 1994 for whatever opportunities might exist in order to have assured loading on their organizations.

17. Further examples on this question will be submitted with the supplementary report.

18. Further information involving specific examples will be provided in the supplementary report.

19. The cost-recovery markup goes as high as 30 percent on work for others. I presume that the rationale for this is the covering of overhead costs versus the direct charges that are incurred by the hands-on laboratory people and the costs incurred in materials, equipment, etc. directly employed. Even in government affairs, incremental pricing makes a difference and we heard informally from others around the government how this fee turns off their compatriots to employ the laboratories when the laboratories probably have the very best people to solve the problem.

We have some of these same problems in industry and when one department decides it wants to markup costs to an adjacent department, it can be a significant turnoff. The effected parties are all one in the same government, it's all one pot and we believe there is a more enlightened pricing and costing relationship that could be effected between the DOE laboratories and their fellow government partners.

20. It was the opinion of our Task Force that there were a number of disconnects within the Department of Energy on the issue of remediation. The Board that we suggest would not have authority. Therefore it would not micromanage. But hopefully it would help the multiple people in the Department, assuming you continue their governance, to see in a more systems approach to things, a better science based way of applying the Department's resources to the remediation problem. This Board would strictly be advisory and if its good advice were heeded there could be an incremental improvement in the judgments that were eventually applied throughout the system.

21. A supplementary report will be presented on this subject regarding the essential justifications for the $400 million estimate.

22. Scientists read the tea leaves. They see their seniors in government so much more interested in process and procedure, accounting details and micromanagement, and observe that the attention given to science versus these other matters is lesser today than it was years ago that their inspiration regarding the status of science is inevitable. Many who scientists are shy about suggesting some of the things they would like to do on the assumption that this would be unappealing to the authorities that have the purse strings control. So much of the funds that are appliable to science are misdirected to these accountability and micromanagement factors that it is discouraging to the scientists to see the waste. Although we did not attempt to trace a timeline, it would appear from reading past reports dissimilar to ours, that people have been alluding to this, if not directly referring to it, as long as 20 years, but it certainly has been intensifying in the last 10 years.

    As one who has had experience with laboratories in the private sector I know the difference between an atmosphere in which the nonscientists get out of the way and let the scientists do their work and then see immense productivity versus when it is presumed by someone who has a high nontechnical title that they can unduly manage the affairs and resources of the scientists.

23. Regarding this issue, we sensed a general feeling; not a specific and attributable feeling to a given section of a particular lab. With regard to isolation it was readily apparent to us that as friendly as many of these people were in one lab to others, that they really were operating significantly as independent entities (partially, in effect, competing with each other) many feeling that their labs were more entitled to funding than their compatriots.

We sensed that many of the laboratories were devoting an extraordinary amount of energy to sweeping up what they needed as support for resources. This contest unto itself was distracting from the exciting science that could be forthcoming if the labs were left alone to do their good scientific work and worked more as a system. This causes a general loss of vitality for science. As one bright young female scientist said to me at breakfast one morning at one of the New Mexico laboratories, "It's getting to the point that many of us are more concerned about our job than about our work." They were so confounded with the intimidating control mechanisms and the administrative duties that they weren't able to put all of their spirit behind what would be the much more exciting and vital role of concentrating on being scientists.

I don't think we can specify a particular research area that has suffered loss of vitality versus any other. We sensed the general spirit of the institution and the distraction that was felt by the professionals. Such distraction generically impacts the vitality of the institution. We have written elsewhere about the loss of vitality in the research areas and that the subject matter of this question is the incremental contribution to that loss. The fact that the laboratories have operated to such a significant degree as independent entities versus reaching out for a more intimate integration and activity as a virtual single laboratory has inhibited the greater flow of information and stimulation between the remarkable talents that exists in each of the laboratories. We're talking about personal communication, a greater freedom of contact and mobility which would add vitality.

24. The Task Force did not attempt to be precise with regard to a number and therefore I do not have a Task Force recommendation. I would offer a personal comment that a fund that could approach 1 percent of the total science budget of the laboratories may not be out of order. If there was a continuing $5 billion allocation to all of the labs which I simply use as a benchmarking number and $50 million were available for this kind of allocation, I would think that would be a remarkable linkage opportunity between the universities and the laboratories. As you know the principal source of funds for the universities comes through the National Science Foundation. I would not substitute anything that is authorizable through NSF. NSF funding should be encouraged and if anything extended. But it may prove to be exceptionally beneficial if the laboratories, knowing what they were doing in general, would have an affordable way of reaching out to universities with $100 thousand here and $50 thousand there and $200 thousand there, in order to use the university's already established best sources of science work to relate to some project that the labs are working on. The labs could avoid reinventing the wheel at the laboratory and one would have in the whole American system greater effectiveness and efficiency.

25. The biggest barrier is the uncertainty as to how the laboratories will be evaluated by those who are holding them accountable. It seems that the interpretations from Inspector Generals and auditors, etc. are almost anecdotal and to the extent that one might be criticized for a specific

allocation of funds and/or charging of time and effort to a project that is tied in with someone else is an inhibitor to people's freedom of assuming the most constructive relationships.

26. I try to provide supplementary information regarding examples but as a preliminary answer to your question, let me give you a worthy experience: Chlorofluorocarbons, CFCs, are chemicals that when admitted into the atmosphere are of grave concern re the effect on the ozone layer. These must be eliminated from processes like the cleaning of semiconductors and plated circuit boards in our industry.

Our company knew it had to contribute to the solution. We had some key ideas. But we could not fulfill the perfection of these ideas as we did not have the laboratory equipment and incremental sophistication that would be necessary to prove the viability of what would be developable as a substitute. We went to one of the national laboratories who were equally cognizant of this problem. They had excellent supporting resources which became leading contributors to the solution. Together, we designed substitutes for the entire electronics industry. We did, incidentally, put the patentable intellectual property into the public domain so that all would benefit.

Here was a case that the private sector could not have solved a vital ecology issue without the presence of a skilled set of scientists and sophisticated equipment that was only available at one of the laboratories.

Part of the reason we made this statement that you cite in question 26 is that we wanted to counter the apparent trend that we noticed at the beginning of our studies that so many people in Washington were of the mind that the laboratories should be put to work as the job shop servants of many companies in order that those companies could create jobs in a short term.

27. I'll have to search my records and I hope I can find some correspondence from people who did write and say what I now state in general terms "My company is in the consulting business. We are preeminent in our ability to counsel in a specific field of competence. A laboratory in our region took on the same class of responsibility for prospective clients. The lab was able to offer the service at a lower price (not necessarily cost) than we could because they could charge as they wished. This removed a business opportunity for us." I'll try to find such a letter for you from my file.

28. I cannot give you a litany of specific partnerships. The input on this was so legion that we just plain didn't keep any record. At almost every laboratory that we visited, we had a meeting with outsiders. Among the classes of outsiders who came were local business people who laudatory about the labs and were using the laboratory. I would guess that at the minimum we met 20 such companies at almost every laboratory. The mix of their businesses ranged all over the lot. Some were in the energy business, some were just very effective local companies who took advantage of the fact that the laboratories in their neighborhood had very smart people. They came and

took advantage of that. As far as I am concerned this is good Americanism. But it is at least distractive. As referenced earlier we kept hearing early in 1994 that "the laboratories could be converted into a major engine to create early jobs in our society. We probably heard hundreds of examples. We don't think this is bad per se but we think it would be wrong if it were allowed to drift into a more pervasive phenomenon.

AMTEX just makes the grade of being justifiable. There are many aspects of what would be studied in behalf of that excellent private sector partnership that will relate to more effective use of energy, cleaner use of energy.

It is likely that other industries might come along that would be far too remote of the energy focus AMTEX, in my judgment, just fits in under the wire.

The New Generation of Vehicles clearly fits because transportation demands a substantial energy input and obviously has significant ecological outputs. We're comfortable with that one.

29. The Task Force did not take cognizance of NASA laboratories, DOD laboratories, etc. but I think that generically the shoe would fit. The Task Force is not recommending corporatizing all government-owned laboratories but I respectfully suggest that if corporatizing makes sense for the 10 laboratories that we looked at it could very well make sense for some others.

The 10 laboratories represent a positive, unique potential for privatization because there is such a relevance between the 10 of them on the subject of energy that it is possible to have an economics of size as well as relevance and the opportunity to construct a virtual laboratory. This could have a leverage in fact for the country.

Incidentally, to size things I hope that you people recognize that these laboratories, even though they are measured in terms of billions of dollars are a relatively small cadre of assets. The company that I have led for many years is four times the size of the laboratories from the standpoint of dollar volume of transactions and has at least as many engineers working for it as the laboratories. This is a relatively small class of organization to bring on to better governance. That's why we are enthusiastic about suggesting that you run this experiment. Try out a different way of doing things for which I think you will be most pleasantly surprised as to the fine results.

30. Some of our members were more sensitive to the corporatizing of the three weapons laboratories because of their particular sensitivity to national security. I think this is a factor that we should learn to get over the hump on. After all, we do depend on Lockheed and Motorola and many others companies to produce all of the other weapons, even though atomic weapons are something special, the private sector does a superb job of instrumenting the needs of our defense requirements.

The negative therefore rallies around impressions, political correctness, things of that nature. From the standpoint of the pragmatic operations, the weapons laboratories would fit as comfortably and effectively into a corporatization structure as would the nonweapons laboratories.

31. When we speak of the spectrum of engineering and science approaches to each of the focused areas, we are recommending that there be a broad spectrum of allowability as to what the laboratories will work on. It is hard to define what is only long-term research versus at the other end of the spectrum, a practical near-term application. Very often the iteration between these two ends of the spectrum influence each other.

    An effort to define a current application may very well restimulate the need for more basic research. So we're saying do not from the Federal level try to tightly pocket the places on the technology spectrum where funds would be applied. But there ought to be another category of spending where the purest of science that relates in some expectable way to energy or ecology, etc. is allowed for. This is elective, it cannot be readily specified as to its assured eventual application and it's one of those likely beneficial rolling of the dice situations where companies like ours or laboratories like yours may just click on something that will then lead to a more specifiable focus into one of the other categories.

32. The Task Force did not specify exact funds per year but I think the following would be faithful to the spirit of what we discussed. We think that the approximate $6 billion, which is the budget of all of the labs, can be reduced by something in the order of $500 million the first full year that the laboratories are freed of the micromanagement processes. As they are freed to operate the new quality management levels better their ability to move from the $5.5 billion that was hypothetically still allowable for the next year, could readily be reduced to $5 billion because they'll just plain learn how to be more effective.

    Now, depending on all manner of policy factors, you the Congress could elect to set some general goals and hope to get the ultimate spending on the currently defined projects down to $4.5 or $4 billion. But we believe that simultaneous with whatever you may wish to orchestrate along that line in response to our other suggestions in the report wherein there will be many places where identifications of new valuable science targets to pursue you may wish to nourish the budget for these newer defined programs that probably will be identifiable on the roadmap that we have called for. Taking this out to five years you can obviously set the number at any size you want but I would think that at least a number of us on the Task Force would say that reducing to a floor of $4 billion would be as low as you should want to go if you have any faith and trust in the fact that science knowledge is going to pay off which many of us feel very confident of. You would likely find persuasive justification for nourishing some new projects that would take the laboratory expenditures then back up another $.5 billion or as much as $1 billion and therefore the laboratories would be producing exceptionally productive work in a range of funds from $4 to $5 billion. Notice that I have blended not only improvements in productivity and efficiency and/or budget pragmatism along with support to new worthy objectives.

33. Again, I have to acknowledge that we did not approach the numbers as an accountant would regarding headcount. But I think we're talking hundreds of people from an administrative standpoint in the bigger laboratories and lesser number in the smaller laboratories. We're talking about very large numbers in the Department. I would think in the range of 5,000 people but again I haven't done a population analysis in the Department itself. Finally, I point out that once you have released the professionals to get back to work without inhibition on the things they are doing, the methodologies that the private sector is learning to engage in will produce laboratory efficiencies that will achieve in some pockets up to the 50 percent improvements.

34. The pro for embracing "corporatized" is that all of the benefits that we speculate are probable to be accomplished. The negatives of not going to corporatization are that there will be a great deal of rearranging of the deck chairs within the Federal norm and for the most part the culture will sustain Congress and the Department will continue to micromanage and probably add people in order to allegedly improve the other entity--the laboratories--productivity which is what federal norms seem to do. You would have at best a modest incremental gain by retaining the GOCO system as presently defined versus a radical improvement if you corporatize.

35. The Task Force did not know of a DOE Laboratory Board as most recently proposed and therefore it did not take cognizance of this suggestion. So I must answer as a private individual. The Laboratory Board will be a further confounding influence. It is not anything approaching an adequate substitute for the Board of Trustees. I would strongly urge that if you retain the GOCO system don't call for a DOE Laboratory Board. It will merely be another layer and interference to the accomplishment of the Department's job.

Robert W. Galvin
Chairman of the
Executive Committee

April 26, 1995

Mr. Mason Wiggins
Committee on Science
B-374 Rayburn House Office Building
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Wiggins:

Attached are the supplementary answers to the document already transmitted to you on April 6.

Best wishes,

Robert W. Galvin

RWG:ch

Attachment

Motorola Inc., Corporate Offices
1303 E. Algonquin Road, Schaumburg, IL 60196-1065 • (708) 576-5300

ANSWERS TO QUESTIONS ON PAGE III(a) - III(i)

11a. Increasing the energy efficiency of a machine or manufacturing process is only one way of conserving energy. Other techniques include reducing the energy requirement (for example, through reducing the mass of an automobile), and substitution (for example, by substituting an entirely new process which uses energy more efficiently).

11b. Fission related power will be used in the rest of the world whether we like it or not. In view of the non-proliferation and environmental problems attendant to these technologies, it would seem in our enlightened self interest to ensure that the rest of the world had access to fission plant variants which are intrinsically safe and from which it is difficult to divert plutonium.

Although several members of the Task Force had different opinions on the subject, in light of the preceding argument I personally found it ironic that the Integral Fast Reactor (IFR) was canceled.

11c. The Task Force had very mixed opinions as to the viability of fusion power, both in the intermediate and long term. Some felt that the probabilities of success were too small to warrant research. Others feel that Fusion offers the only hope for truly clean, pollution free energy; and that the more we work on it the sooner we will achieve it.

15. As the report states, the Task Force did not elect to take on the task of suggesting specific areas of programmatic focus for each of the national laboratories, but recommended instead that the Department and the national laboratories together move promptly to establish clear mission statements (p.26). We believe that the process of defining such missions will provide an excellent opportunity to clarify the world-class strengths within each of these institutions, as well as the areas which may be appropriate for downsizing, elimination, or consolidation elsewhere within the laboratory system (p. 26). As stated in our report, mission descriptions should capture the primary focus or strategic thrust of each laboratory, while also identifying the two or three areas of secondary importance based on specialized capabilities. While we believe that the Department and the laboratories should go much further than they have to date in providing a strategic focus, we also recognize that there are important practical limitations on how narrowly these missions can be delineated without compromising the strength of the multiprogram laboratories.

16. Examples include research on conservation and renewable energy technologies, which is presently distributed over several of the multiprogram laboratories as well as the National Renewable Energy Laboratory; the DOE contribution to the human genome project; and the

laboratories' participation in some of the larger CRADAs, including the AMTEX consortium.

17. Many national laboratories (e.g., LBL, LLNL, LANL, SNL, ANL, ORNL, BNL, PNL and INEL) and universities (e.g., Rice University, University of California, University of Vermont, Colorado School of Mines, and many others) are developing computer models for groundwater contaminant fate and transport to support site remediation design and assessment. With few exceptions, these efforts are not well integrated with each other or with the needs of potential users among site compliance or operations personnel.

Novel applications of tiltmeter technology, "borrowed" from oil field applications, may be able to replace the drilling and hydraulic testing of hundreds of wells, but the small business that initiated this application was unable to find sponsorship to move forward after promising initial field tests.

18. Non-Aqueous Phase Liquid (NAPL) contaminants are currently viewed as one of the most daunting classes of site remediation challenges. Dynamic Underground Stripping, developed by LLNL and the University of California, has been successfully field tested at a gasoline-contaminated site involving heterogeneous fluvial soils. This technology promises a near term, cost effective remedy for NAPLs, but additional development and testing are needed to extend its range of applicability to other hydrogeologic settings.

Several national laboratories and universities are investigating the effects of sorption processes and phenomena and the effects of subsurface heterogeneties on the fate and transport of in situ contaminants. As it matures, this work will support smart development, selection and design of site cleanup technologies; better understanding of contaminant fate and transport will also support technically defensible risk assessments.

Other technical areas whose more rapid and advanced development could lead to faster and more effective cleanup or remediation efforts: microbial filters which might replace now-ineffective pump-and-treat methods; fiber-optic sensor cables for assessment of High Level Waste Tank contents; advanced means of destruction and/or stabilization of toxic wastes.

26. Leading examples are the large-scale accelerator facilities that are operated by the laboratories for substantial outside user communities. These facilities provide primary beams of photons, electrons, protons, and heavy ions and secondary beams of other particles such as neutrons and radioactive ions with unique energy and current or brightness characteristics. Much of the time the users of these facilities are scientists from universities or other government laboratories engaged in

fundamental research. But the unique characteristics of these beams are in some instances also of great value in industrial research applications.

At the Advanced Photon Source at Argonne, the unique characteristics of the beams will be used by industry teams for both fundamental and proprietary work. As one example, investigators from eleven pharmaceuticals firms have formed the Industrial Macromolecular Crystallography Association to use the APS to determine the structures of biological macromolecules in order to aid in the design of biologically active compounds for medicine and agriculture and to guide protein engineering to develop molecules with improved properties.

Another example is provided by the Advanced Light Source at Berkeley, which is used by the computer industry for materials characterization studies of disk drives, and by the pharmaceutical industry for crystallography studies.

It is also important to recognize that the development of these large scale facilities and their continuous improvement provides a rich milieu for training and innovation over a wide spectrum of technical areas of direct value to industry, including electronics, vacuum techniques, large-scale data acquisition and computer systems with corresponding software development, novel detection system and sensors, automated high-level control systems, ion-beam and accelerator technology, and superconductivity.

Response of
Siegfried S. Hecker

Director
Los Alamos National Laboratory

to
Followup Questions
submitted by Mr. Rohrabacher
Subcommittee on Basic Research
and
Subcommittee on Energy and Environment
Committee on Science
United States House of Representatives

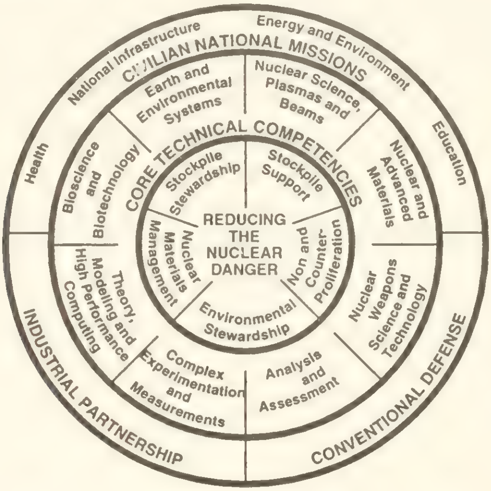
April 11, 1995

1. *On page 1 of your prepared statement, you state that the Los Alamos' "principal mission for at least the next decade is to reduce the global nuclear danger."*
Is this the official Los Alamos mission statement, and if not, what is the official mission statement?

Our "official" mission statement:

> "The Los Alamos National Laboratory is dedicated to developing world-class science and technology and applying them to the nation's security and well-being. The Laboratory will continue its special role in defense, particularly in nuclear weapons technology, and will increasingly use its multidisciplinary capabilities to solve important civilian problems."

developed over two years ago, reflects the vision we had at the time of our role in the changing world. As a result of the Galvin Task Force deliberations and our own strategic planning process, we set about to focus that mission statement more clearly, and to emphasize how the different components work together. The result is best summarized by the following diagram.


CIVILIAN NATIONAL MISSIONS
National Infrastructure
Energy and Environment
Health
Education
INDUSTRIAL PARTNERSHIP
CONVENTIONAL DEFENSE
CORE TECHNICAL COMPETENCIES
Earth and Environmental Systems
Nuclear Science, Plasmas and Beams
Nuclear and Advanced Materials
Nuclear Weapons Science and Technology
Analysis and Assessment
Complex Experimentation and Measurements
Theory, Modeling and High Performance Computing
Bioscience and Biotechnology
Stockpile Stewardship
Stockpile Support
Non and Counter-Proliferation
Environmental Stewardship
Nuclear Materials Management
REDUCING THE NUCLEAR DANGER

As shown in the diagram, "Reducing the Nuclear Danger" is the core mission of the Laboratory. the five elements of that principal mission are described in my testimony. This mission is supported by eight core competencies: nuclear and advanced materials; nuclear weapons science and technology; nuclear science, plasmas and beams; analysis and assessment; complex experimentation and measurements; theory, modeling, and high-performance computing; bioscience and biotechnology; and earth and environmental systems. These core competencies in turn provide the basis for us to participate in civilian national missions, conventional defense R&D, and industrial partnerships. Work in these areas serves other important national needs while providing critical support to our core mission by strengthening and maintaining our core competencies. Thus "Reducing the Nuclear Danger" is an effective shorthand for our mission, but it requires an understanding of the competencies required to fulfill that mission and how they will be supported. I will return to these themes in answering others of the questions.

2. *The Galvin Task Force Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions.*

Would you concur that the Los Alamos' mission suffers from such a lack of focus?

I do not concur with this assessment as it applies to Los Alamos. As I discussed above, we have a clear idea of our mission, the competencies required to perform that mission, and the resources needed to support those competencies. As I mentioned in my testimony, five of the seven nuclear systems that will remain in the U.S. nuclear arsenal after the turn of the century were designed and engineered by Los Alamos. We have an obligation to support these systems and the nation's nuclear defense posture in the broadest sense.

3. *At the bottom of page 4 of your prepared testimony you state that "[w]e also will require continued excellence in several core competencies."*

Could you please define more clearly what these "several core competencies" are for Los Alamos?

The core competencies, listed in my response to question one, are:

- nuclear and advanced materials;
- nuclear weapons science and technology;
- nuclear science, plasmas and beams;
- analysis and assessment;
- complex experimentation and measurements;
- theory, modeling, and high-performance computing;
- bioscience and biotechnology; and
- earth and environmental systems.

As I discussed in my written testimony, the Laboratory's identity and international recognition rests upon its sustained performance in satisfying national needs in science and technology. We have developed these competencies in response to national needs and we will be able to satisfy those needs in the future only if we maintain the health and vigor of our scientific competencies in these areas. We also must maintain these competencies in order to fulfill our core defense mission. However, we recognize that because of funding constraints, the nuclear weapons program alone cannot support these competencies adequately. In order to maintain the ability to perform our core mission, we must compete for programs in other areas that can help support these competencies. The key to our future success will be the extent to which we are able to maintain the multiprogram nature of our Laboratory and the synergy that supports defense as well as other national needs.

4. *On page 4 of the Galvin Task Force Report, it is stated that "[w]e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist."*

   a. *Do you share this Task Force belief, and if not, why not?*

The division of labor among the laboratories, industrial research institutions, and research universities is in flux. Industry has dramatically changed its approach to research and development, with a much greater emphasis on short-term, product-oriented development. The end of the Cold War has challenged the consensus, described almost fifty years ago by Vannevar Bush, that made the case for federal involvement in R&D. We have not yet established a new balance among these three very important sectors of the national R&D enterprise and so I must concur with the Galvin Task Force Report in this conclusion.

   b. *If you do concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where are we currently out-of-balance?*

In my view, the more appropriate question to ask is: what is the role of the three sectors in the overall picture of national R&D. Industry's role is to provide the market-driven and technology-driven products that will ensure a healthy and competitive economy. This involves product development, applied research and some measure of basic research that together provide the industry with the technical components needed to prosper in its existing business as well as the basis for the development or acquisition of new lines of business. The role of the research universities is to educate the next generation of leaders, in science and technology as well as in commerce and other fields, and to conduct basic and applied research as part of this educational mission.

The laboratories' role is to carry out and support R&D that is truly *national* in scope; R&D for which the American people are the principal beneficiary. This includes national defense, of course, but also work in areas of energy and environment and national infrastructure issues such as transportation and health care delivery. The national laboratories also provide some of the wherewithal for industrial and academic R&D through the operation of large-scale user facilities. In addition, I believe that the national laboratories can enter into partnerships with industry and the academic community that assist both of these entities in achieving their goals while supporting the competencies needed to fulfill their own national missions. Balancing is a continuing and dynamic process. What is important is that each of the individual entities has a clear view of its role. However, I believe that within these roles, there has been an overall shift towards a short-term focus for R&D that does not serve the nation well. Vannevar Bush's description of the role of science and technology in the national well-being is still accurate.

5. *On page 19 of the Galvin Task Force Report, it is stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency renewable energy, and basic energy sciences)."*

   a. *Would you concur with this statement, and if not, why not?*

I agree with this statement and would expand on it to include issues of environmental quality as described by the Galvin Task Force Report.

   b. *Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?*

How the Department reorganizes itself to meet this challenge is a complex question. Certainly, some consolidation is called for. The Task Force on Strategic Energy Research and Development, chaired by Daniel Yergin, is examining this precise question. Their report is scheduled for release in June and I commend their efforts to the Committee.

6. *On page 20 of the Galvin Task Force Report, it is stated that "[t]he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency conservation, renewable energy sources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D. "*

   Do you share this Task Force belief, and if not, why not?

I believe that a somewhat broader view is required. The government and the Department have an important role to play in assuring that economic growth leads to a future in which the nation achieves its economic, environmental, and energy goals simultaneously, without compromising the ability of future generations to meet their own needs. Along with the development of more effective energy technologies, the integration of materials issues with product design and recycling—a consideration of the inputs and products of the manufacturing cycle often referred to as industrial metabolism—will require an understanding of complex natural and social systems beyond anything we are capable of today. As I stated in my testimony, the Department should develop roadmaps for energy and environment, cleanup, and science similar to that developed for the nuclear weapons program to guide future development in these areas. One of the features of an energy technology roadmap should include consideration of nuclear energy technologies, such as accelerator driven fission, that would be more environmentally benign and could be more acceptable to the public. In addition, work for other government agencies must be strategically incorporated to provide the proper synergy with the Department's missions. The Galvin Task Force dealt with these issues separately and they should be more closely integrated. Congress can help by encouraging the Department to take this approach. Again, I believe that the Yergin Task Force will provide a thoughtful guidance on this question as a result of its deliberations.

7. *On page 25 of the Galvin Task Force Report, it is stated that "to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."*

   Do you concur with this Task Force statement, and if not, why not?

I largely concur with this assessment. Recently, there has been a tendency to avoid making difficult decisions on facilities and programs and to "spread the wealth" rather than to build on the individual strengths of the laboratories. Both the DOE and the Congress have at times encouraged this approach, not using existing competencies as the basis for further development; but instead opting to create new competencies at some of their laboratories (or even new laboratories). However, spreading the wealth should not be confused with necessary redundancy. All laboratories must have essential competencies in materials, computing, and systems integration if they are to be able to perform their missions.

8. *On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas"?*

   a. *Do you concur with this Task Force statement, and if not, why not?*

This is one conclusion of the Galvin Task Force Report with which I emphatically do not concur. The laboratories are vital and vibrant research institutions, interacting with many university researchers. While our location was chosen for its isolation in 1943, in today's world of electronic communication and air travel, we are hardly isolated. At Los Alamos, our staff is drawn from the from across the nation. Collaboration with university faculty is absolutely essential to help assure that our staff is respected by the nation's and world's best researchers. We typically have affiliate or guest scientist agreements with more than 2,500 faculty members from universities across the nation and around the world. This includes several hundred faculty members who visit the Laboratory each year for seminars and workshops. We also involve students and postdoctoral fellows in the Laboratory's programs. It is not unusual in a typical year to have 400 postdoctoral fellows and 1500 students working at the Laboratory and participating in its programs.

The result of these interactions can be seen in the quality of the research done at the laboratories. The successful and substantial accomplishments of the laboratories over the years, from the early cyclotrons to the development of nuclear weapons to the construction and operation of large-scale user facilities, serve as partial validation of the quality of the research done at the laboratories. These developments often flow from civilian research to defense applications and back again. The Manhattan project was built on the foundation of civilian nuclear physics research at universities and it in turn led to the flowering of basic research in the structure of matter in the post-WW-II era. Knowledge of accelerator design from the nuclear and high-energy physics programs in turn supported the Strategic Defense Initiative and the possibility of accelerator production of tritium. The laboratories have shown again and again the ability to develop new capabilities in order to execute programs and projects to meet national needs. They have the ability, unmet by any other institutions, to respond substantively to complex, long-term, cross cutting issues of national importance. While this history may have resulted in some duplication of capabilities among the laboratories, these achievements were not made in "physical and intellectual isolation".

Let me cite just two examples of the quality of laboratory involvement in the broader research community. One of our physicists, Paul Ginsparg, developed a system to exchange preprints of scientific papers electronically in order to expedite interactions among researchers in high-energy particle theory. His e-print archive has become the standard for electronic exchange of preprints in many fields, now processing over 45,000 inquiries from 25,000 users every day. The NSF recently awarded Los Alamos over $1 M to advance this concept and support professional maintenance and documentation of the archive. Paul's work has done much to decrease the isolation of all scientists. As another example of the quality of the work of the laboratories, we may consider the extent to which publications by laboratory staff are cited by their colleagues in other research. While publication rates vary with the missions of the individual laboratories, the impact of research at the laboratories, as measured by the number of citations of that research by other researchers, is comparable to that of the best research universities in many areas of science and technology. In the ultimate arbiter of scientific quality, peer reviewed research, the laboratories hold their own with the best researchers in the world.

b. If you do concur, what specific research areas do you believe have suffered a loss of vitality?

Not applicable.

9. *We heard testimony during our budget hearings in February that DOE personnel could be reduced by one-third to one-half without harming mission performance.*

a. Do you concur with the view that DOE personnel could be reduced by one-third to one-half without harming mission performance, and if not, what, if any, level of DOE personnel reductions would you recommend?

The private sector has found that personnel reductions on the order of one half have typically improved quality and shortened cycle times while cutting costs. Although it is difficult to extrapolate industry's experience to a government R&D function, it still seems reasonable to me that it may be possible to effect similar savings within the DOE system. This level of personnel reduction should be sought both within the DOE and within the portions of the laboratories that do not directly contribute to our product, which is science and technology.

I want to stress, however, that this level of savings would be possible only under the radical changes in governance and oversight proposed by the Task Force. This would require unprecedented cooperation between the executive and legislative branches of the government.

b. Which areas of DOE personnel should/could be cut?

Working with the Under Secretary of Energy, Charles Curtis, the laboratories have begun to design a roadmap for improvements in laboratory management by the Department. There are two key areas which offer opportunities to reduce DOE overhead and increase productivity at the laboratories. These areas are administrative oversight and environment, safety, and health oversight and regulation.

The government owns the laboratories and should decide what they do. Contractors engaged by the DOE for laboratory management should decide how to do it. By relying on the private sector to bring the best business and operational practices to the laboratories, the Department can and should phase out all federal procurement, personnel, financial, and business practice restrictions on the laboratories. It should replace present operational oversight and micromanagement with productivity targets based on private sector benchmarks.

The role of the field offices in operational oversight needs to be simplified. Currently, most formal directives pass through one or both (Los Alamos and Albuquerque) field offices. Many of these directives, however, come directly to us from DOE headquarters. If the operational oversight interface were simplified, our costs would be lower and the redundancy and confusion inherent in multiple interactions would be eliminated.

I believe that if we are to succeed in responsible facility management and efficient delivery of R&D, the present approach to oversight and compliance must be changed. Over the last decade or so, a multilayered system of oversight has developed, particularly in the environment, safety, and health areas, that is inefficient for the government and drives our costs up unnecessarily.

The focus of the Department's concern with environment, safety, and health issues should be results, not process. The Department should phase out all of its own regulatory and oversight functions and substitute the existing body of law that applies to everyone through oversight by other federal agencies such as EPA, OSHA, and NRC, as well as appropriate state and local authorities.

10. *If the DOE management layers were reduced, could Los Alamos National Laboratory function more efficiently, and if so, how much money could be saved ?*

I first want to address the actions we have already taken and are planning to reduce our costs. We are working hard to reduce the impact that external regulation and oversight have on our costs and productivity and we are working to make further improvements in our operations to reduce other controllable costs. Actions taken already by our Laboratory have resulted in savings of about 7% of our total annual operating budget, which has resulted in greater productivity for our scientists. However, these savings have been more than offset by the cost of additional requirements imposed upon us by DOE. We believe that other actions we can take internally can save an additional 3%. Thus we have taken the initiative to reduce costs and improve our own effectiveness.

If DOE management and oversight burdens on the Laboratory were reduced to a level consistent with that required to safeguard the public's investment in the Laboratory and its operation, I believe that additional savings of 10% to 15% could be realized. This level of savings requires a joint effort by Congress and the DOE to move to a more results-based system of contracting. As I stated in my testimony, the major changes outlined in Appendix B of the report aimed at fixing the GOCO system would go a long way to remedy excessive oversight and micromanagement. Any changes made should be based on three overarching principles:

- Laboratories are responsible and accountable for operations and compliance,
- Assessment of laboratory performance is based on well understood, continuously-improved metrics, and
- Prudent business practices based on the best private sector examples are used as benchmarks for evaluation.

11. *What specific DOE management practices would you alter to improve the efficiency of your laboratory?*

I have already addressed this question to some extent in my response to question 9. As you rightly point out, changes in the DOE could result in greater savings for the Laboratory in addition to savings at the Department. As I mentioned above, the greatest opportunity for savings (about half of the total potential savings) would come from an overhaul of the DOE's duplicative environment, safety, and health regulatory apparatus. Further significant savings could be obtained if DOE oversight of our business practices was replaced by performance-based management modeled on best-in-class business practices.

12. *Out of every dollar appropriated to your laboratory, what is your best-estimate of the fraction of that dollar that actually gets to the scientist doing the research ?*

Not enough! The current climate of excessive oversight has taken its toll on the amount of science and technology we are able to do. The Government-University-Industry Research Roundtable of the National Academies is conducting a study of the cost of research across the nation's research community. We are participating in this study and believe that the results from this study, put in the context of other research providers, will provide the most meaningful answer to your question. In the mean time, the best estimate that I can venture now is that approximately one-half of the dollar actually goes to the organizations doing research within our laboratory. However, these organizations and the researchers themselves spend an increasing fraction of their time on oversight related functions.

I thank you for the opportunity to clarify my statement before the Committee and will be glad to respond to further questions.

Sandia National Laboratories
Managed and Operated by Sandia Corporation
a Lockheed Martin Company

Albuquerque, New Mexico 87185-0101
Livermore, California 94551-0969

A. Narath
President

April 7, 1995

The Honorable Dana Rohrabacher
Chairman, Energy and Environment Subcommittee
U.S. House of Representatives Committee on Science
Suite 2320, Rayburn House Office Building
Washington, DC 20515-6301

Dear Representative Rohrabacher:

Thank you for asking me to participate in the March 9, 1995, Joint Subcommittee Hearing on Alternative Futures for the Department of Energy National Laboratories.

Enclosed are my responses to the follow-up questions we received from your staff. I would be happy to provide more information on these or other issues at your convenience.

Sincerely,

Sandia response
Follow-up questions from Chairman Rohrabacher
March 9, 1995, Joint Subcommittee Hearing
Alternative futures for the Department of Energy National Laboratories

1. On page 4 of the Galvin Task Force Report, it is stated that "[w]e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist."

    a. Do you share this Task Force belief, and if not, why not?

    We do not concur. Sandia and its sister national laboratories have worked with private industry and universities since the inception of the Atomic Energy Commission, not only to leverage varying areas of expertise but to complete our mission responsibilities cost-effectively. As a project-driven, industrially managed laboratory, Sandia continually strives to establish appropriate divisions of labor among our partners to improve quality and cost-effectiveness. These divisions of labor vary according to the nature of a particular program.

    b. If you do concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where are we currently out-of-balance?

    Without doubt, improvements in collaboration among federal laboratories, universities, and private industry can be made. Managing the DOE laboratory complex as a system of laboratories, and enabling the national laboratories to establish high-level partnerships with industry consortia, universities, and other federal agencies would help ensure that, program by program, appropriate divisions of labor could be made.

2. On page 10 of the Galvin Task Force Report, it is stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences)."

   a. Would you concur with this statement, and if not, why not?

      Sandia concurs with this statement. A "systems view" of energy sources, their benefits for different applications, and their drawbacks for others has been missing in the management and direction of energy R&D programs. We believe that the Department is aware of and agrees with this assessment.

   b. Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?

      A number of structural options might be developed to better integrate DOE's energy R&D programs, including the one mentioned here.

3. On page 20 of the Galvin Task Force Report, it is stated that "[t]he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D."

   Do you share this Task Force belief, and if not, why not?

   This statement is taken from the chapter on Energy and Environment in a subsection on national and global energy needs. It is not true for the Department taken as a whole, given the Department's role in national security (defense) and environmental R&D.

   Within the energy arena, however, these priorities are reasonable as the correct areas for government-funding: longer-term R&D that can provide quantum advances and can thus provide future alternatives. We regret that fusion energy was not listed. Although a long-term option, it is the only enduring energy option for terms of hundreds of years. While unlikely to pay dividends in our lifetimes, fusion energy technology advances could revolutionize energy supply and bestow great economic advantages in the long term.

4. On page 25 of the Galvin Task Force Report, it is stated that "to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."

Do you concur with this Task Force statement, and if not, why not?

The Defense Programs laboratories have coordinated operations since the days of the Atomic Energy Commission, and we continue to allocate resources effectively to meet the needs of the Department of Defense.

However, there is merit to this observation when considering coordination of work among all of the DOE national labs. We agree with the suggestions following the cited statement in the Galvin Report: program efforts should be coordinated among the labs, optimizing their relative strengths.

The Department of Energy and its laboratories have recognized the problem noted by the Galvin Task Force and have initiated a number of efforts among the lab directors and the Department to define missions and identify centers of excellence.

5. On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas"?

   a. Do you concur with this Task Force statement, and if not, why not?

      Sandia challenges the accusation of isolationism by pointing to the extensive interactions with universities and private industry throughout our history. Indeed, the Department of Energy and its laboratories could not have met their mission responsibilities in the past, nor can they meet them now, without such interaction. As one illustration of this point, Publications Citation Indexes demonstrate that our industrial and university colleagues consider the DOE labs to be leaders in producing research results of value to them.

      The statement about entitlement is harder to challenge, as this was one of the reasons a national laboratory system was established: to conduct R&D for national needs. Sandia has benefited from its industrial management heritage in undergoing the required cultural change away from an entitlement mentality to one of demonstrated, valuable return on the taxpayers' investment.

   b. If you do concur, what specific research areas do you believe have suffered a loss of vitality?

      Vitality of the R&D at Sandia remains high, as evidenced by metrics such as the Publications Citation Index, R&D 100 awards, and other nationally recognized awards and competitions. Sandia has managed its programs carefully to minimize and eliminate research programs that do not add significant value to the Department of Energy.

      However, there is no doubt that increased administrative burdens and budget uncertainties take their toll on staff morale. A strong sense of compelling national mission, which helped contribute to an extremely motivated staff, has diffused and now needs rejuvenation.

6. We heard testimony during our budget hearings in February that DOE personnel could be reduced by one-third to one-half without harming mission performance.

   a. Do you concur with the view that DOE personnel could be reduced by one-third to one-half without harming mission performance, and if not, what, if any, level of DOE personnel reductions would you recommend?

      The small ratio of government overseers to laboratory scientists and engineers during the first thirty years of the nuclear weapons program is a historical precedent for this assertion. However, times have changed: there are many more requirements on DOE programs now, which in turn force an increased amount of oversight.

      We believe that DOE personnel can be reduced by some amount without harming mission performance, if concomitant requirements for excessive oversight are similarly cut. The precise level of cuts should be determined in accordance with private industry (large corporations) management theory and practice.

   b. Which areas of DOE personnel should/could be cut?

      Multiple levels of program oversight should be compressed. The decentralized structure of DOE field offices is a good concept, but it needs streamlining. We should avoid centralizing oversight and decision making in DOE headquarters and instead delegate many functions to a slimmed-down, field management system. Specific areas of reductions might include staff supporting audits, appraisals, and oversight.

7. If the DOE management layers were reduced, could SNL function more efficiently, and if so, how much money could be saved?

   If DOE management layers were reduced, Sandia could undoubtedly realize cost savings; the magnitude of savings would depend on the amount of change at DOE. Sandia is independently undergoing a major reengineering effort to streamline our administrative overhead. The target is to reduce overhead costs by 20% in two years.

8. What specific DOE management practices would you alter to improve the efficiency of your laboratory?

   The prime areas of waste are in the oversight of purchasing, financial accounting, and ES&H. The culture has changed to become focused on compliance rather than the high-performance teams that characterized Sandia's work in the past.

   Excessive and redundant audit examinations of laboratory operations should be substantially reduced. Reliance on external regulation and best business practices would be viable alternatives.

9. Out of every dollar appropriated to your laboratory, what is your best estimate of the fraction of that dollar that actually gets to the scientist doing the research?

   The definition of what fraction of a dollar gets to a scientist is problematic. If this is meant to include a scientist's salary, benefits and retirement, and R&D program-related costs such as equipment, laboratories, and office space, the percentage of budget directly "getting to a scientist" is roughly 70-80%. The remaining portion of Sandia's budget goes to management costs including site-wide environmental safety, human resources, physical (site) security, and infrastructure and facilities support.

Response of
C. Bruce Tarter
Director
Lawrence Livermore National Laboratory

Followup Questions
submitted by Mr. Rohrabacher
following a Joint Hearing of the

Subcommittee on Basic Research
and
Subcommittee on Energy and Environment
Committee on Science
United States House of Representatives

April 12, 1995

1. *What is Lawrence Livermore National Laboratory's (LLNL's) official mission statement?*

The mission of the Lawrence Livermore National Laboratory is to serve as a national resource in science and engineering, focused on national security, energy, the environment, and bioscience, with special responsibility for nuclear weapons.

The Laboratory's mission is dynamic and has been changed over the years to meet new national needs. The Laboratory's Mission Statement is included in our Institutional Plan which is updated annually.

2. *The Galvin Task Force Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions.*

Would you concur that the Livermore's mission suffers from such a lack of focus?

All of our programs fall within the mission areas defined in our mission statement and are managed in a complementary and synergistic manner consistent with the contract between the University of California and the Department of Energy. We draw on our core technical base and continuously renew the scientific, engineering, and management expertise needed for our principal programs.

Each program has specific deliverable products not being provided by any other source. The work of these programs is defined by work statements which represent specific agreements with the customers to produce these deliverables (knowledge or physical or analytical tools: scientific information, simulation codes, analyses, materials, and prototype systems).

3. *What are LLNL's core competencies?*

Framing the Laboratory's Future, a vision statement which was published in June 1994, addresses this question directly:

"The most distinguishing feature of the Livermore Laboratory is our ability to integrate many, often disparate, areas of science, engineering, and management to solve complex technical problems.

"The scientific, technological, and management capabilities developed for specific projects intertwine synergistically across program boundaries. This multi-disciplinary, multi-program approach is the Livermore way of scientific problem solving.

"As a result of this approach to applied science, we have developed a suite of strengths that have application in a range of current and future technical endeavors. . .." [page 3].

Specific core competencies identified in our vision statement include the following:

- *Nuclear science and technology:* Expertise developed during more than 40 years of excellence in nuclear science and technology directed at the development of nuclear weapons and the harnessing of thermonuclear and fission energy for civilian power will serve the Nation in the continuing work of stewardship of the remaining stockpile, stemming proliferation of weapons of mass destruction, and dismantlement.

- *Lasers and electro-optics:* Livermore is the preeminent laser science and technology laboratory in the world.

- *Computer simulation of complex systems:* The simulation of complex phenomena--for example, predicting the dispersion of hazardous materials resulting from major accidents, behavior of fluids under extreme conditions, or properties of designer materials--requires world-class computational facilities and staff.

- *Advanced sensors and instrumentation*: Our need to understand complex phenomena, ranging from nuclear explosions to the behaviors of materials on a microscopic level, has driven the development of state-of-the art instrumentation for detecting, measuring, and analyzing a wide range of physical events.

- *Biotechnology*: Established originally to understand the effects of ionizing radiation on humans, the biomedical sciences program has drawn on the Laboratory's base of multi-disciplinary expertise in physical and life sciences, computations, and engineering, to transform its focus and to bring unique capabilities to characterizing the human genome and solving health issues at the molecular level.

- *Advanced process and manufacturing technology:* Through our focus on applied science, we have developed a broad-based, in-depth understanding of processing and manufacturing technologies, specifically in chemical, biological, and photon processes, advanced materials, precision engineering, microfabrication, nondestructive evaluation, and complex-system control and automation.

These core competencies, drawn together in a multidisciplinary framework, are foundational for many other competencies which are described in detail in other publications. Maintenance of these competencies, originally developed to support the Laboratory's nuclear weapons role, has been essential to the Laboratory's success in applying this science in other areas.

4. *On page 4 of the Galvin Task Force Report, it is stated that "[w]e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist."*

   a. *Do you share this Task Force belief, and if not, why not?*

We agree that an appropriate division of labor can and should be established between U.S. industry, the national laboratories, and the research universities. Each type of institution brings a different emphasis and skills to their respective missions. A formalized division of labor on the large-scale level should be carefully studied as a cost-saving measure; but at the smaller project level, it would probably not be cost-effective, nor advisable from the point of view of quality.

   b. *If you do concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where are we currently out-of-balance?*

The decision as to which institutions should pursue a project would best be handled on a case-by-case basis, as it depends on the nature of the task and the skills that different institutions can bring to bear on the solution. In general, the balance should emphasize long range and global missions for the national laboratories in areas which U.S. industry would not find it cost effective to pursue; federal and university assistance to smaller industries that cannot afford their own research base; and education and training of tomorrow's technical and industrial leaders in the universities, in collaboration with the national laboratories and U.S. industry. In addition, a few laboratories such as LLNL bring a unique and powerful multi-disciplinary approach to projects which is not generally to be found in universities, in the industrial laboratories, or in most other federal laboratories.

5. *On page 19 of the Galvin Task Force Report, it is stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental*

energy R&D programs (i.e., fossil energy, nuclear fission and fusion, energy efficiency renewable energy, and basic energy sciences)."

a. *Would you concur with this statement, and if not, why not?*

b. *Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?*

As a Laboratory we have been striving to develop, in an operational and programmatic way, the concept of "global ecology" or "sustainable development," and we attribute some of the difficulty in accomplishing this to a lack of integrated policy objectives at the national level. Therefore we support the Galvin recommendation (also on page 19) that a portfolio of programmatic activities be organized according to a common framework of policy objectives.

A necessary next step appears to be systematic modeling, environmental and resource impact analysis, and prioritization of various approaches. These activities will involve different agencies in government, the universities, and the private sector. When this integration is accomplished, the appropriate organizational and programmatic structure can evolve. It is somewhat difficult to comment on the current organizational arrangement because our understanding of DOE in particular is generally limited to the organization as it interacts with LLNL, usually not as it operates with respect to the rest of DOE, other agencies, universities, the private sector, and Congress. DOE is currently in the process of developing restructuring plans according to its Strategic Alignment Initiative; in addition, the upcoming Yergin Panel report should provide recommendations related to these matters.

6. *On page 20 of the Galvin Task Force Report, it is stated that "[t]he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency conservation, renewable energy sources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D."*

Do you share this Task Force belief, and if not, why not?

We view energy R&D generally to be of very high priority for the U.S. Every study of future energy needs that includes projected population growth points to a widening gap in the world's energy supply occurring in the next century. Although the timings and magnitudes vary with assumptions, this general conclusion persists for all credible scenarios. The appropriate policy would be to pursue several paths in parallel. The renewable sources will play important roles when they can be economically developed. For this reason their development should be pursued, however with a continuing eye to their true practicality and economic promise. For true base-load electric power production in the future, it appears today that the only long term options are two: advanced-fission (nuclear) power, which is essentially available today; and eventually, fusion power, whose economic promise has yet to be proved.

Accordingly, in addition to the renewables, we advocate continuing development of the advanced nuclear options which have eliminated the safety concerns of the first generation of reactors, and of fusion as a long-term energy research program aimed at an ultimate energy source.

7. *On page 25 of the Galvin Task Force Report, it is stated that "to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."*

Do you concur with this Task Force statement, and if not, why not?

This statement addresses the issue whether the Laboratories have been managed as a Laboratory system. DOE's utilization of the Laboratories as a system needs improvement, but the current situation did not result principally from a policy of "spreading the wealth". A preferred management system would create more Centers of Excellence, more sharply defined missions, more lead laboratories, etc. These should be based on utilization of the core competencies of each Laboratory; however, each Laboratory must maintain its set of core competencies to enable it to carry out successfully its multidisciplinary missions.

8. *On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas."*

a. *Do you concur with this Task Force statement, and if not, why not?*

b. *If you do concur, what specific research areas do you believe have suffered a loss of vitality?*

The basis for this statement was not established in the Galvin Report, and we do not concur with this finding. LLNL has perhaps more vitality and quality than ever before, especially when viewed as a problem-solving applied Laboratory. Our workforce, and its ability to solve problems cost-effectively with applied teams, is without peer in the country. Many blue-ribbon peer reviewers have rated our science and technology as "excellent" or "outstanding" in recent times.

With respect to an attitude of being entitled to funds: if such an attitude ever existed at the Laboratories, it exists no longer. Strict cost-saving measures are enforced throughout the Laboratories. And Livermore, situated in the vital and stimulating Bay Area, does not suffer from physical isolation - which many attribute as a factor leading to our superior workforce. Given the structure of today's science and the availability of virtually instantaneous world-wide communication, it is now quite difficult to become intellectually isolated.

All three University of California Laboratories enjoy extensive peer review networks which utilize outside scientific review committees. All three Laboratories bring in a constant inflow of world-class scientific visitors. In LLNL's case, a recent review of our science and technology performance indicated an excellent and vital research program across all programmatic areas.

Many examples can be found for LLNL's vitality and its links to the Laboratory's past. To name just one, this year a new radar technology, called Micropower Impulse Radar or MIR, was developed which promises to have wide impact in world markets. Invented by LLNL scientists searching for ways to measure fast laser pulses, the MIR technology is novel in its small size, low power requirements, and low cost. Already, licenses have been issued to companies for finding studs in walls and for automobile back-up warning systems. Some 1997 cars will come equipped with warning sensors using the MIR. Many hundreds of other commercial applications exist for the MIR, as noted in the March, 1995 issue of Popular Science, and dozens of licenses are currently under negotiation. In addition, LLNL is developing further uses of the radar for government and humanitarian purposes such as border surveillance, land-mine detection, and medical applications for non-contact measurement of vital signs.

9. *We heard testimony during our budget hearings in February that DOE personnel could be reduced by one-third to one-half without harming mission performance.*

   a. *Do you concur with the view that DOE personnel could be reduced by one-third to one-half without harming mission performance, and if not, what, if any, level of DOE personnel reductions would you recommend?*

   b. *Which areas of DOE personnel should/could be cut?*

It is our understanding that DOE has a task force which is addressing the question of staffing levels and deployment. While staff savings are doubtless possible, particularly if the Galvin Task Force Appendix B recommendations regarding structure and operation are implemented, it is difficult for us to speculate on the size of possible staff reductions DOE-wide. There are a number of parts of DOE that do not relate to the national Laboratories at all.

With respect to those parts of DOE that do impact the Laboratories, an appropriate approach would be for a determination to be made as to what functions can be eliminated or reduced, and for staffing reductions to be mandated reflecting cuts in programs and functions. As an example, DOE could greatly reduce the extent and nature of its oversight, much of which is marginal-value-added, labor-intensive, and often tends to duplicate that of external regulatory organizations. In addition, program shifts, such as toward "smart" clean-up, should have beneficial effects on staffing. Reductions at LLNL and in contracted out work would also follow as a result of these steps.

10. *If the DOE management layers are reduced, could Lawrence Livermore National Laboratory function more efficiently, and if so, how much money could be saved?*

The Galvin Report identifies many management problems within the Department and proposes, in Appendix B, ways of organizing and operating to address them. In the interim, DOE has taken a number of positive steps to improve management of its Laboratories, and it has begun a major restructuring effort which will doubtless result in a simplified organizational structure.

In our experience, the most directly burdensome problems resulting from management layers within DOE are (a) the need for closer coordination between the local field office and Headquarters, and

(b) disconnects between programmatic organizations in Headquarters and the contract management function in both the field and Headquarters. In case (a), it is not obvious that the field offices as entitites have appropriate decision authority. At the present time, over 200 DOE field office personnel exist on site to oversee LLNL and approximately 200 additional DOE workers are stationed at the Oakland Operations Office. In case (b), the bureaucratic requirements of the contract management function, including ES&H and the directives system, often contravene program progress in a way that does not further the objectives of the total system.

Although the many variables in the equation mitigate against predicting actual savings, we believe considerable effort and cost savings could be realized if DOE were to correct this situation and change its focus to our performance results customized to the situation at hand, rather than excessive focus on processes, trying to make "one size fits all".

11. *What specific DOE management practices would you alter to improve the efficiency of your laboratory?*

We are working with DOE to propose and effect changes in the following management practices to improve the efficiency of our Laboratory:

- Change the current compliance approach from one based on prescriptive DOE orders to performance-measured compliance based on best business practices, risk assessment, and requirements of external regulation.

- Radically restructure the acquisition process away from the "federal norm" to one based on best business practices. A major change has already been initiated throughout DOE.

- Examine and improve the quality of personnel that interact with the Laboratories, including restructuring old conflict-of-interest laws to permit the most capable personnel in the nation's R&D community to undertake public service in the federal government.

- Enhance the way in which the improvements directed by senior DOE personnel are incorporated into day-to-day operations as they affect the Laboratories, especially with respect to duplication of oversight efforts.

- Contract management and compliance functions should be required to support program progress through cost-effectiveness. Contractors should be trusted with full accountability for their management functions.

12. *Out of every dollar appropriated to your laboratory, what is your best estimate of the fraction of that dollar that actually gets to the scientist doing the research?*

The average is approximately 68%, but the answer to this question can range from 50% to 80%, depending on the nature of a particular research program and on how supporting research is counted. In general, for programs where approximately half of the expense is for personnel and half for procurements, about 80% of the overall expense supports technical work and about 20% goes to overhead. For programs with little procurement, the balance shifts toward 50% technical and 50% overhead. The averaged Budget Office answer is 68%, which removes General & Administration costs, Lab Facility Charges and electricity maintenance, and Materials Processing Charges from the "direct support" received by the scientist. The 68% contains the salaries and benefits of the scientist, direct technical support, average procurements, travel, allocated Program Management Charges, facility utilization, allocated Organizational Personnel Charges, as well as any direct services such as Technical Information Department support and computer services used by the program.

Response to Questions for the Record

COMMITTEE ON SCIENCE

SUBCOMMITTEE ON BASIC RESEARCH
AND
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

JOINT HEARING
ON

Alternative Futures for the Department of Energy National Laboratories
("The Galvin Report")
and
National Laboratories Need Clearer Missions and Better Management
(a GAO Report to the Secretary of Energy)

April 12, 1995

RESPONSES FOR THE RECORD TO REPRESENTATIVE BILL BAKER OF CALIFORNIA

I. *Dr. Tarter, in your written testimony, you provided some informative examples of DOE laboratory activities which are working best. What about in the areas of nonproliferation and counterproliferation of nuclear weapons, which I consider vitally important to this nation's security?*

ANSWER: There are many areas in nonproliferation and counterproliferation that are working well and several areas that need better government planning and support. The situation is best described in my recent written input to the Hearing of the Subcommittee on Military Procurement/National Security Committee/US House of Representatives March 29, 1995, which is attached. The section on proliferation starts on page 16.

Briefly, the situation is this:

1) In arms control, which has a direct bearing on nonproliferation, the Comprehensive Test Ban negotiations have very good DOE laboratory support. Livermore is supplying the Chief Technical Advisor in Geneva, and we are the lead-lab for the seismic aspects of the treaty. We are also providing the lead for technology in monitoring the Chemical Weapons Convention. A key development is miniaturized chemical analysis vans and kits that can be taken onsite to suspected or declared facilities. These technology

developments, like most of our new technology for nonproliferation and arms control, also have many applications for law enforcement and environmental monitoring. A core capability in this area is our internationally recognized Forensic Science Center.

2) In nuclear material control, DOE has several related programs that are getting a good handle on this worldwide problem. Its program in Surplus Fissile Material Disposition is using the appropriate capabilities of several laboratories, including LLNL, to solve the U.S. disposition problems. The Material Protection and Control Activities and related projects are aimed at solving problems associated with Russian nuclear material. Additionally, we have just started to develop proposals for programs that would address the nuclear smuggling threat that has received attention recently as a result of Russian and East European smuggling incidents with plutonium and enriched uranium. We believe this a thrust area that LLNL could take a lead in and which is vitally important to national security. We would build on the already established LLNL-operated DOE Communicated Threat Credibility Center.

3) In U.S.- Russian activities, the arms control and nuclear material control activities are included here, and numerous other programs are in place to involve U.S. and Russian industry in defense conversion work, to develop joint peaceful projects between U.S. and Russian laboratories and institutes, and to send emergency response equipment to former Soviet Union nuclear-weapon republics (under Nunn-Lugar). DOE plans to expand the funding for Russian activities in FY96.

4) In intelligence assessments, as DOE's lead-lab in proliferation assessments, we continue to supply expert analysis on all the critical regions in the world -- North Korea, India-Pakistan, the Mideast, and others areas that have issues associated with weapons of mass destruction.

5) In proliferation detection with sensors, DOE initiated an ambitious development program about three years ago that is using several labs, including LLNL, in a joint research effort to develop advanced sensors based on lasers, electro-optical, and other technology that will be able to detect the early stages of proliferation and monitor treaties from a variety of ground, air and space platforms. This work should also benefit DOD's counterproliferation programs where battlefield surveillance is needed.

6) In international support, we continue to supply inspectors to Iraq when needed, and recently supplied missile monitoring equipment in support of IAEA and UNSCOM. We also provide expert advice and analysis to IAEA on many regional issues, such as North Korea.

7) In counterproliferation, we are working closely with DoD to plan for concepts and sensors. We hope that DOE labs will be asked to contribute significantly to the DoD programs. We have been using our Conflict Simulation Laboratory for twenty years to help the DoD train for operations and to evaluate advanced hardware and operational concepts.

8) In counterterrorism, which is closely linked to counterproliferation and nuclear material control, we have made significant breakthroughs in concepts and hardware that can find and disable nuclear devices in cities or on battlefields. We are proposing increased effort in this important area, which would build on the DOE NEST (Nuclear Emergency Search Team) program.

II. *The Galvin Report noted excessive micromanagement and costly bureaucratic oversight of DOE laboratories. What is your experience at Livermore and what should Congress do about it?*

ANSWER: Lawrence Livermore National Laboratory (LLNL) and most other Department of Energy (DOE) facilities face growing challenges of declining budgets, changing missions, increasing regulatory oversight and altered organizational roles and responsibilities. These changes have stimulated the promulgation of requirements and procedures which have greatly increased the cost of operations. The discussion of these topics in the Galvin Report adequately represents our experience at LLNL.

At all organizational levels within the DOE complex, changes are occurring which are impacting roles, responsibilities, administrative workloads and operating costs. From the LLNL perspective, the most significant cost drivers are in three major areas:

Increasing Regulations - which frequently overlap and sometimes conflict.
Increasingly Prescriptive Operating Practices - which do not emulate private sector best business practices.
Increasing Oversight Activities - which increase staffing requirements and do not produce cost effective results.

Specifics are as follows:

Increasing Regulations - Major growth in:

- Environment, Safety & Health (ES&H) - new laws and major amendments increase requirements.
- Nuclear Safety - new DOE Rules increase requirements.
- DOE Orders and Directives - achieving compliance with the multitude of directives issued in recent years greatly increases cost.
- Applicability of Other Non-DOE Regulations - added applications of state and local regulation to DOE activities is increasing.

Increasing regulation of our activities is a fact of life which must be incorporated into our normal operating practices. However, with its Orders and Directives, DOE has moved to establish even greater and more costly requirements, primarily in reaction to heightened public concerns and intensified Congressional oversight.

The enhanced regulatory requirements were focused primarily on DOE production sites, since most of the DOE ES&H problems were at these sites and most of the DOE/Atomic Energy

Defense Activities appropriations were dedicated to programs at these sites. However, for expediency DOE decided to apply essentially the same requirements to R&D activities and facilities as were applied to production sites and related activities. Imposing production site requirements on R&D activities has created significant implementation problems and has unnecessarily increased the cost of doing business at the Laboratories.

Increasingly Prescriptive Operating Practices - DOE established as objectives:

- Meet or exceed requirements.
- Assure prescriptive compliance - redirects focus from results to process methodology.
- Separate enforcement from programs - eliminates any incentive for regulatory functions to seek most cost effective compliance.
- Build up qualified staff to that necessary to accomplish these objectives - many staff with the necessary special training and capabilities must be added especially by DOE, but also by contractors, to focus on adherence to process methodology.

Moving toward the objective of operating in prescriptive compliance with requirements has forced a costly paradigm shift in the roles and responsibilities of DOE and its "Management and Operations" (M&O) contractors. The M&Os have been directed to focus much more on implementing uniform operating practices, at the expense of achieving other program milestones. Overemphasis is on process with under emphasis on technical results.

Imposing a uniform approach on the widely diversified activities of DOE, particularly applying it to both production and R&D activities, has greatly constrained the contractors' ability to creatively seek the most cost effective solutions for meeting requirements. This effectively negates one of the principal advantages expected from hiring private contractors in the first place.

Increasing Oversight Activities

- DOE and DOE Contractor Credibility Eroded - DOE acknowledgment of lack of qualified staff, together with revelations of major environmental problems at DOE contractor sites, greatly undermined the credibility of DOE and DOE contractors.
- Oversight Increased to Counteract Loss of Credibility - Vastly increased oversight of contractors - production, operating and R&D - was implemented in response to the decrease in credibility.
- Roles and Responsibilities Altered - Major changes in roles, responsibilities and management systems have resulted.

The reaction of greatly increasing DOE oversight has strongly impacted operations and greatly increased the cost of doing business. More DOE staff providing oversight requires more contractor staff to respond to their specific needs. In practice, this has become a very intrusive and costly interaction with little or no added value.

In order to move toward operating more like the private sector and reducing the cost of doing business, LLNL recommends the following policy level initiatives:

Regulations

- Customize requirements
  - Establish R&D oriented requirements for R&D and production oriented requirements for production.
- Use national standards
  - Limit DOE Orders to unique requirements not covered by national standards.

Operating Practices

- Delegate authority
  - Provide broad program direction to Labs and hold accountable for quality results.
  - Eliminate prescriptive compliance approach.

Oversight

- Use graded approach for oversight
  - Establish a quality based cost-benefit driven process for audits, reviews and appraisals by the cognizant agencies/bodies.

Adoption of these basic policy measures would provide a solid foundation on which to construct a more cost effective operating framework. Adding to this framework, incentives to utilize best business practices acquired from the private sector, would set the stage for achieving substantial reductions in the current cost of doing business.

III. *Dr. Tarter, the University of California has operated three DOE laboratories over the entire period since the Labs were first established. I understand your new contract changed some provisions of the original arrangement. How is it working?*

ANSWER: UC has a history of five decades of successful public service associated with the management of the three DOE national laboratories. While past contracts were quite successful in their times, the current contracts represent a new and innovative approach to laboratory management. By their design and through their implementation, the contracts seek to balance scientific and programmatic flexibility with management accountability in response to changing national priorities. They are meant to simultaneously meet the oversight needs of DOE, support the principles inherent in not-for-profit government contracting, preserve the special needs and characteristics of the laboratories and UC as a government contractor, and hold UC to high standards of management.

These contract extensions are not only consistent with, but were precursors to the efforts being spearheaded by Vice President Gore to "reinvent" government and by Secretary O'Leary to bring major change to DOE. These efforts all strive for quality improvement. Furthermore, the new UC-DOE contracts already embody many of the improvements sought by the DOE Contract Reform Team as discussed in their report, "Making Contracting Work Better and Cost Less," e.g., performance-based, customer involvement, increased accountability, incentives, etc. They also contain the flexibility to incorporate many of the potential efficiency measures called for in the report, e.g., make-or-buy redesign of operating procedures, fixed-price subcontracting, joint ventures with the private sector, etc. – and several of these are already actively being pursued. We believe that as we gain experience in these new performance-based contracts we can even improve them further.

"Performance " is the operational word and concept represented by these changes – performance and the objective measurement of performance – to drive continuous improvement in laboratory operational and administrative management. Already we have seen definitive results – the FY94 DOE management appraisal of all three laboratories concluded UC management of both scientific programs and business management activities "Exceeded expectations."

Finally, the essence of this renewed contractual relationship is one of "partnership" between DOE, the laboratories, and UC. The desired end product can best be described as "partnering for performance." We are partnering with each other in many ways, including communication processes built into the contracts, and we are performing through incentivized performance objectives also built into the contracts.

In summary, we believe the contract has broken new ground, is working well, and, quite frankly, is serving as a "model" for many people who are striving to define government contracting relationships for such important and specialized needs as managing a world-class scientific laboratory.

IV. *In your testimony you state the importance of working with industry -- and I couldn't agree with you more. How does this apply to the National Ignition Facility proposed for the Livermore Lab?*

ANSWER: As you know, the National Ignition Facility (NIF) is a "National Center" proposed by the U.S. Department of Energy for Science Based Stockpile Stewardship, and to study inertial confinement fusion (ICF) and high-energy-density science. It will be used by scientists from many institutions and scientific disciplines. LLNL is DOE's preferred site for the NIF. The NIF will use an extremely powerful laser, consisting of 192 laser beams, to heat capsules containing fusion fuel to a point of "ignition," which will liberate more energy than is required to produce the fusion reaction. This technical capability will:

- Help to assure the reliability, safety, and effectiveness of the U.S. nuclear weapons stockpile.
- Determine the scientific feasibility of ICF as a future source of clean, plentiful energy.
- Advance basic science and technology.
- Enhance the competitiveness of key American industries.

American industry and inertial confinement fusion: long-term partners

U.S. industry has been a major participant in the rapid progress of ICF research since the discovery of the laser in 1960. LLNL researchers have worked closely with American suppliers to meet the exacting requirements for construction of the seven high-power laser facilities built and operated by LLNL for fusion research since 1972.

Although LLNL provided some of the funding and occasional expert assistance, U.S. manufacturers applied their own resources to achieve the required technological advances. Companies, large and small, acquired new technology and expertise, developed advanced fabrication methods, and lowered production costs while creating unique products for the world marketplace.

Significant technology transfer occurring today is a result of the strong partnership between American industry and ICF research. The laboratories of the national ICF Program have won 24 Cooperative Research and Development Agreements (CRADAs), totaling over $160 million, in microelectronics, microphotonics, advanced manufacturing technologies, biotechnology, precision optics, environmental sensors, and information storage. The ICF Program has won 22 R&D 100 awards (3 last year), representing 1/2 of the LLNL total. One of these recent inventions has won a Technology Transfer Award. This "radar on-a-chip" has recently been highlighted on the cover of Popular Science magazine.

One additional area of significant commercial potential is manufacturing semiconductors with the advanced x-ray optics, components, and systems developed by the U.S. ICF program. This technology can help America regain preeminence in this $100 billion a year world market.

The NIF will greatly enhance key American industries

Industrial partnerships flowing from the NIF project are sure to have an even greater positive impact on U.S. companies than previous and current collaborations because of the NIF's much greater power requirements and sophisticated experimental capabilities. The majority of the NIF's funding (> 70%) will be spent outside the National Laboratories and will go to America's manufacturing, engineering, and construction industries.

The NIF's multiple applications for defense, energy, and scientific research will enhance major industries, making them more competitive in the world marketplace and creating valuable, new, high-technology career opportunities. The NIF will impact companies involved in precision optics manufacturing, integrated-circuit manufacturing, optical crystals, optical coatings, ultrapure glass, computer controls, diagnostics, power system components, welding and cutting technologies, high-voltage technology, and high-speed digital transmission. Many of the companies expected to contribute to the NIF are small businesses making highly specialized products.

The NIF's spin-off applications will include optics manufacturing, laser-material interactions, biology, communications, and plasma processing. In optics manufacturing, the NIF will reduce production costs for America's crystal growth industries, help lithography/silicon chip companies, and improve manufacturers' capability to produce large-aperture, precision optical components. Spin-off applications from the NIF's target chamber, diagnostics, and various other components will advance ultrafast instrumentation and micromachining technologies.

In addition, in building the facility and assembling hundreds of state-of-the-art components, the project will enhance the expertise of U.S. construction and engineering industries.

The Manufacturing Readiness Plan

The large-aperture, precision optics fabrication industry, in particular, will be deeply involved in technology advances to assure both performance and cost effectiveness of the NIF. To control laser beam qualities, the NIF will make use of advanced laser glass, optical glass, thin-film optical coatings, optical machining and polishing, and specialized crystals and plates.

To meet these technical and manufacturing challenges, LLNL and the optics industry collaborated to create the Manufacturing Readiness Plan, a collective set of technology and manufacturing capability developments intended to:

- Provide the NIF Project and the national ICF Program with assured sources of supply of improved quality materials and components at reduced costs.
- Advance the technical capabilities and cost competitiveness of the U.S. precision optics industry.

The Manufacturing Readiness Plan encompasses recent planning and technology developments, various design options, and development opportunities that may further reduce facility cost and improve facility performance. In addition, expansion and modernization of manufacturing facilities for optical materials and laser components will be necessary to meet the NIF schedule and cost goals.

The NIF Will Stimulate Further Developments in the Optics Industry

Further development, concentrated primarily in advanced manufacturing technologies, is required over the next three years to meet the cost goals for the NIF. These technologies include:

- Large volume manufacturing capability for phosphate laser glass.
- High-speed polishing and deterministic finishing for low-cost precision optics.
- Rapid growth of large KDP and KD*P crystal boules.
- Improved coating process design and control for mirrors and polarizers.
- Meniscus-coating technology for gratings and sol-gel multilayer mirrors.
- Improved process control for low-cost fused silica.

The optics-development program planned for the NIF will have the dual benefit of substantially reducing optics costs for the project as well as helping the U.S. optics industry better compete in the international market. The French, Japanese, and British governments are all considering building large fusion lasers similar to the NIF. This development program will also position U.S. optics companies to compete for these substantial orders, in addition to those for the NIF.

Recent estimates put the annual sales of precision optics in the United States at $3.4 billion. Between 10% and 20% of this figure is for large optical components, or about $350 million to $700 million. From development through production, approximately $200 million will be spent on the NIF optics program. Thus, it will be a project of major importance to the U.S. optics community, generating many high-technology production jobs. Virtually all of the technology development will either lead to new spin-off technologies or products, or will enhance the ability of U.S. companies to compete in the international optics arena beyond the fusion optics market. For example:

- Laser glass melting and forming technology can be applied to making a variety of ultraviolet and infrared transmitting glasses for medical and industrial applications, including, for example, ozone detection, laser surgery, and medical spectroscopy.
- The technology developed for low-cost optics fabrication will enhance optics manufacturers' abilities in computer-aided manufacturing and automated design and production by developing a new generation of precise and efficient production machinery.
- Rapid growth technology for KDP and KD*P crystals can be adapted to improve the growth of other important crystals for applications including frequency conversion and detectors for the high-energy physics community.
- Improved coating capabilities will be applied to expanding worldwide markets including computer displays and medical instruments. Meniscus-coating technology developed at LLNL is already being used to manufacture high-efficiency gratings with applications in high-power lasers.
- Technology created to reduce the cost of transmitting fused-silica optics for the NIF will also help U.S. manufacturers to compete in the market for the next generation of ultraviolet lithography equipment.

These conclusions are documented by letters of support for the NIF written by long-standing ICF optics manufacturing companies, as well as by the Society of Photo-Optical Instrumentation Engineers (SPIE) with over 350 member organizations, the American Precision Optics Manufacturers Association (APOMA) with over 100 member organizations, and the Laser and Electro-Optics Manufacturers Association (LEOMA) with approximately 50 member organizations.

Industrial Stakeholders Briefing

To further enhance the partnership with industry, the NIF project hosted an Industrial Stakeholders meeting on February 2 and 3, 1995 in Pleasanton, California. It was attended by over 400 individuals representing approximately 250 companies from 35 states. The aim of the meeting was to provide technical information exchange based on the recently completed NIF conceptual design. The interaction was very successful as evidenced by the many positive responses from the participants. We expect that this will be the first of several interactions with the industrial community. Erlene DeMarcus, from Congressman Baker's office spoke at the meeting and expressed strong support from the project and its multiple missions.

FRAMING the LABORATORY'S FUTURE

A VISION FOR LAWRENCE LIVERMORE NATIONAL LABORATORY

June 1994

University
of California

Lawrence
Livermore
National
Laboratory

UCRL-AR-117362

Core Values

Integrity
Excellence
Commitment

To provide the scientific and technological tools needed to meet critical national missions in the next 20 years, we must cultivate and inspire a quality-driven Laboratory staff guided by the highest principles. Adherence to core values is the criterion by which our contract with the nation is evaluated.

- *We will continuously earn and uphold the public trust.* This requires **Integrity** in:
  - Maintaining the highest ethical standards in science and technology.
  - Supporting a culture of academic freedom.
  - Demonstrating personal and institutional responsibility in our business operations.
  - Assuring honest, open interactions with all customers and team members, within the Laboratory, in the communities we serve, and with our partners.

- *To solve the nation's biggest technical problems, we will have the best science, engineering, management, and people.* This requires **excellence** in:
  - Discovering and executing creative, innovative solutions to complex problems.
  - Attracting and encouraging the best available talent.
  - Enhancing the diversity and capabilities of our workforce.
  - Motivating and rewarding employee excellence.
  - Managing business, safety, and the environment to achieve a high level of accountability in an atmosphere of continuous improvement.
  - Leading or participating in cost-effective team partnerships.

- *As a national laboratory, we will meet the nation's needs.* This requires **commitment** to:
  - Meeting the goals and requirements of our customers.
  - Focusing our science and technology on national objectives.
  - Continuously improving our productivity and efficiency.
  - Aggressively helping our Laboratory and our partners achieve maximum benefit for the nation.

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Vision and Goals

The future of our Laboratory demands change.

Today's world requires a fresh assessment of the role of the national laboratories in general and the role of the defense laboratories and Livermore in particular. The future of our Laboratory demands change.

The Department of Energy's national laboratories were born out of an urgent need to direct the best that science and technology could offer to the most pressing national issues. The three national defense laboratories were created because it was believed that they could accomplish their vital mission faster, better, and with greater certainty than any combination of private industry and universities. The remarkable success of that initiative remains the foundation of these laboratories and inspires our efforts today.

Today, the challenges facing the nation have changed, but the need for the national laboratories remains. Experience has shown that these laboratories are most valuable when:

- The national interest is at stake.
- The best science and technology are required.
- Large and complex research facilities are needed.
- Expertise in a variety of disciplines must be integrated.
- The technical risk is high, with the potential of very high rewards.
- A sustained commitment is needed.
- The job will go undone if the national laboratories don't do it.

At Livermore, we are changing to meet today's challenges. By matching our areas of expertise to pressing national and global challenges, we are focusing on three areas of long-term importance where our contributions are unique and valuable:

I. Global Security: Reducing the Nuclear Danger
II. Global Ecology: Harmonizing the Economy with the Environment
III. Bioscience: The New Frontier

Our global security program has two major thrusts: to reduce the nuclear danger by ensuring confidence in the safety, security, and performance of the U.S. stockpile; and to prevent and counter nuclear proliferation by applying our expertise in nuclear science and technology. The safe and secure "builddown" of the world's stockpiled weapons will be a continuing responsibility. We will be carrying out these responsibilities in concert with the other two defense laboratories as part of the Department of Energy's integrated plan. The application of our advanced defense technologies will significantly enhance our nation's ability to use nonnuclear means for containing regional conflicts.

Harmonizing the demands of the world's economy with the needs of the environment is a crucial national and global issue. Achieving this balance will require energy sources that are safe and clean as well as manufacturing processes and consumer goods that make wise use of resources and provide for the protection of the environment. We can contribute to all aspects of this challenge—developing energy sources, working with industry to

Our vision for the future of the Livermore Laboratory is one of sustained, results-oriented excellence.

devise advanced manufacturing processes, and developing innovative and cost-effective technologies for environmental management and cleanup.

Bioscience is the new frontier of research. For the first time in history, the tools exist to decipher the genetic blueprint (DNA) and reveal the basic science of human life. This knowledge will make it possible to ameliorate, cure, or even prevent genetic diseases, enhancing the quality of life and decreasing the health-care costs to society. The fruits of this human biology research will undoubtedly carry over into agriculture, environmental management, and industry.

Beyond our primary focuses, we will continue to support other innovative science and technology initiatives that have the potential for high impact in their field and that reinforce our scientific and technological strengths. In addition, we remain committed to fostering science and math education to help ensure the scientific literacy of the general population and to inspire future generations of scientists and engineers.

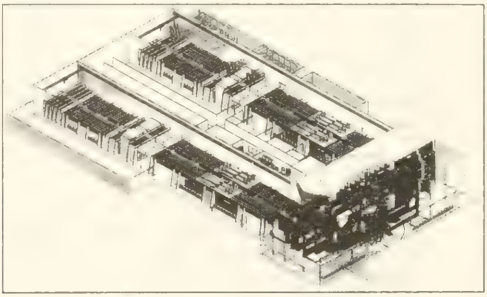
To realize this vision, we will rely on our excellent and diverse staff. Robust quality management systems will be put in place to ensure that Laboratory operations are accountable, cost-effective, and meet measurable performance standards.

Our vision for the future aligns with the business areas identified in the Department of Energy's new strategic plan: national security, energy resources, environmental quality, and industrial competitiveness—all addressed through science and technology. We will build on and enhance partnerships with Departmental staff to ensure excellence in the achievement of our common goals.

Attaining our goals will also require new forms of cooperation among the national laboratories, universities, and industry. Key national facilities will be built and used by multi-institutional teams of researchers. Laboratory sites will be readily accessible to outside partners. The commercialization of new technologies will be the planned end product of these collaborative projects.

Our vision for the future of the Livermore Laboratory is one of sustained, results-oriented excellence. We are committed to serving the country as a national resource of scientific and technological expertise, dedicated to global security, the environment, and the future scientific needs of the nation.

The proposed National Ignition Facility.



Integrating Multiple Disciplines To Solve Complex Problems

The most distinguishing feature of the Livermore Laboratory is our ability to integrate many, often disparate, areas of science, engineering, and management to solve complex technical problems. We have delivered, for example, fully tested nuclear weapon designs, the Nova laser, the atomic vapor laser isotope separation system, several generations of magnetic fusion facilities, world-class precision machining capabilities, and the sensor systems for the Clementine satellite.

The scientific, technological, and management capabilities developed for specific projects intertwine synergistically across program boundaries. This multidisciplinary, multi-program approach is the Livermore way of scientific problem-solving.

As a result of this approach to applied science, we have developed a suite of strengths that have application in a range of current and future technical endeavors:

- **Nuclear science and technology.** The Laboratory has demonstrated 40 years of excellence in nuclear science and technology directed at the development of nuclear weapons and the harnessing of thermonuclear and fission energy for civilian power. To fulfill our responsibilities for the enduring stockpile without nuclear testing, we must now depend on *a priori* physics knowledge, detailed computer simulations, and experiments at special national facilities that can create extreme conditions of matter. Our nuclear science expertise is being applied to stem nuclear proliferation and to develop innovative, lower-cost techniques for environmental cleanup.
- **Lasers and electro-optics.** Livermore is the preeminent laser science and technology laboratory in the world. We have built six major laser systems, including Nova (currently the world's largest laser) and the industrially qualified atomic vapor laser isotope separation (AVLIS) system. The laser for the National Ignition Facility will provide more than ten times the power of Nova at a greatly decreased unit cost. We are also world leaders in applying laser and electro-optic technologies to a wide range of civilian and defense needs.
- **Computer simulation of complex systems.** Livermore's strength in computation originates with the scientists and engineers who simulate complex phenomena—for example, the behavior of fluids under extreme conditions, the structure of biomolecules, properties of designer materials, and changes in global climate. This work requires world-class computational facilities. We currently operate a large national-security computer center as well as the Department of Energy's national energy research computer center. Livermore also operates the national energy sciences network and the national information storage laboratory. Computer modeling is our method of first resort for examining and evaluating new concepts and systems.
- **Advanced sensors and instrumentation.** Our need to understand complex phenomena, ranging from nuclear explosions to the behavior of materials on a microscopic level, has driven the development of state-of-the-art instrumentation for detecting, measuring, and analyzing a wide range of physical events. Concurrent development of fiber optics, microelectronics, and technical-data-processing systems has given us the capability to design and build sophisticated measurement systems. These systems are finding widespread use in such applications as nonproliferation, environmental monitoring, and space-based scientific measurement.

The most distinguishing feature of the Livermore Laboratory is our ability to integrate many, often disparate, areas of science, engineering, and management to solve complex technical problems.

Livermore is the preeminent laser science and technology laboratory in the world.

- **Biotechnology.** Established more than 30 years ago to understand the effects of ionizing radiation on humans, our biomedical sciences program has transformed itself to focus on understanding health issues at the molecular level. This focus is possible because we can draw on a base of multi-disciplinary expertise that integrates the physical and life sciences, computations, and engineering. We have assembled the technical infrastructure required for comprehensive studies of genetic susceptibility to disease and the mapping and sequencing of an organism's genome. We have developed many of the instruments and techniques now used worldwide in biological research, including high-speed flow cell sorters, whole chromosome paints, monoclonal antibodies, gene-mapping and DNA-sequencing technologies, and "libraries" of mapped DNA segments.
- **Advanced process and manufacturing technology.** Through our focus on applied science, we have developed a broad-based, in-depth understanding of processing and manufacturing technologies. Livermore is specifically known for innovation in chemical, biological, and photon processes, advanced materials, precision engineering, microfabrication, nondestructive evaluation, and complex-system control and automation.

Our multi-program, multi-disciplinary approach is most successful when our capabilities are complemented and enhanced by those of our partners in academia and industry.

The Clementine satellite.

Focusing on Global Needs

By comparing the distinguishing strengths of this Laboratory with the pressing technological issues facing the nation and the world, we have identified three areas in which we can make unique and valuable contributions.

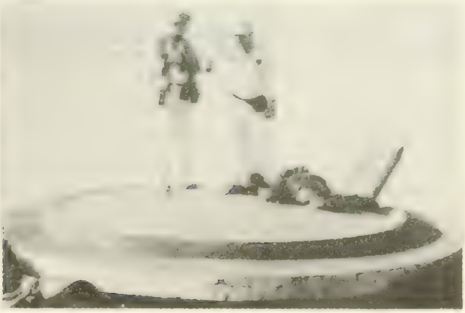
I. Global Security: Reducing the Nuclear Danger

The dramatic reduction of the international nuclear threat is one of the greatest accomplishments of this era. Nonetheless, nuclear dangers remain today and for the foreseeable future.

We are committed to providing the technical support this nation needs to help resolve political conflicts peacefully and eliminate anarchy and terrorism. At the same time, we have a continuing responsibility to help maintain a strong and flexible national defense.

To these ends, we are tackling the problems of ensuring the safety, security, and reliability of the enduring U.S. nuclear stockpile; preventing nuclear proliferation; and helping to dismantle and dispose of the materials from thousands of nuclear weapons. We are also applying our capabilities to meet the needs of the Department of Defense for conventional, high-technology weapons.

- **Stockpile stewardship.** As a result of the cessation of nuclear testing, new ways of ensuring confidence in the safety, security, and performance of the U.S. stockpile are needed. Instead of an empirical approach to stockpile stewardship (based in large part on data from nuclear tests), we must develop a science-based approach. We will:
  * Exploit the performance and speed of massively parallel computers to expand the scope and quality of our numerical simulations.
  * Devise ways of obtaining more detailed data from nonnuclear experiments.
  * Use the proposed National Ignition Facility to provide critical data to help resolve stockpile issues and to attract and train the high-quality staff necessary for the stewardship program.
  * Develop a multi-axis, multi-time radiographic facility for improved hydrodynamic testing.
- **Nonproliferation.** Preventing, reversing, and responding to nuclear proliferation are top priorities for national and global security. To support these goals, we will expand our efforts as follows:
  * Develop remote sensors and analysis techniques, integrated into space, air, and ground-based platforms, to detect signatures of clandestine nuclear weapons programs and to help verify international arms-control and inspection agreements.



UN inspection of Iraqi nuclear weapon facilities.

The dramatic reduction of the international nuclear danger is one of the greatest accomplishments of this era.

As a result of the cessation of nuclear testing, new ways of ensuring confidence in the safety, security, and performance of the U.S. stockpile are needed.

- * Provide expertise and technology to establish dismantlement, tracking, and transparent accountability regimes for the control of nuclear weapons and fissile materials worldwide.
- * Support cooperative activities with the nuclear inheritor states of the former Soviet Union to speed the dismantlement of their nuclear weapons and the conversion of their weapons laboratories to civilian projects.
- * Develop more effective technical capabilities to find and neutralize battlefield and terrorist nuclear threats.
- * Assess counterproliferation strategies and develop advanced nonnuclear weapon and sensor systems for use by the military using computer-based conflict simulation and comprehensive systems analysis.

• **Dismantlement.** We have enduring responsibilities for ensuring the safe and environmentally sound dismantlement of the stockpiled weapons. Of particular concern is the safe storage and long-term disposition of the nuclear materials. We will:

- * Develop technologies and procedures for verifying the dismantlement of nuclear weapons, for processing the materials for disposition, and for placing the nuclear materials under international safeguards without releasing information that would aid proliferant nations.
- * Develop technologies for the environmentally sound disposal of high explosives and other weapon materials.

• **Advanced conventional weapons.** Technologies developed for the nuclear weapons program will be applied to Department of Defense missions, including highly intelligent weapons, high-performance explosives, and high-technology countermeasures. These activities will provide the dual benefits of maintaining and enhancing our nuclear-weapon core competency while addressing perennially unsolved defense problems.

II. Global Ecology: Harmonizing the Economy with the Environment

A sustainable economy requires that the demands of production and consumption be in harmony with the global environment. This balance requires energy that is abundant, safe, and clean; transportation systems that do not pollute; and production and consumption processes that use resources wisely, recycle materials efficiently, and dispose of wastes safely. For these advances to be truly effective, they must derive from a globally held view and provide for widespread economic development without causing adverse ecological changes.

This vision is a challenge of epic dimensions, one that will require the best efforts of the world's scientific and political institutions. Reengineering the industrial-economic system to one that supports the environment is a global priority. The Laboratory has begun developing technologies that will support U.S. leadership in this worldwide endeavor.

• **Environment.** To ensure that new activities do not cause ecological harm, we need a fundamental understanding of the global environment and the benefits, risks, and costs of alternative options. Livermore is a world leader in environmental modeling, with decades of experience in the assessment of hazards. We will broaden the scope of these efforts in order to develop the elements of a comprehensive Earth-system model that integrates the impact of human and natural activities on Earth's environment.

Of near-term importance are issues related to environmental remediation and treatment of toxic wastes. The proposed Mixed Waste Management Facility will provide a testbed for evaluating technologies for treating previously untreatable mixed waste (waste that is both radioactive and chemically toxic). In addition, we are providing the technical bases for major elements of the Yucca Mountain Repository program to provide safe disposal of high-level radioactive waste.

- **Energy.** With the development of appropriate policies and technologies, an evolving mix of fossil, fission, and renewable energy—each producing progressively less environmental damage—can meet this nation's energy needs for the next half-century. To this end, we have developed the atomic vapor laser isotope separation (AVLIS) process to reduce the cost and environmental impact of processing fuel for fission reactors. We are also improving the safety of reactor control systems, fuel transport, and high-level waste disposal.

Fusion is being developed internationally as the energy source for the long term. Our magnetic fusion work is carried out in collaboration with international partners to develop the tokamak concept as well as alternative concepts that might lead to smaller, cheaper reactors.

We are world leaders in inertial fusion research. Building on the accomplishments of the Nova laser, we expect to demonstrate energy gain for the first time ever with the proposed National Ignition Facility.

- **Transportation and advanced manufacturing.** Transportation and manufacturing play key roles both in the economy and in the environment. These industries must strive to achieve essentially zero emissions, energy efficiency, safety, and cost effectiveness.

Our contributions to transportation technology will come from work on electric and electromechanical energy-storage systems for electric vehicles, on lightweight ultrahigh-mileage gasoline-powered vehicles, and on hydrogen as an alternative transportation fuel.

We will also apply our expertise in precision manufacturing (materials, fabrication, assembly) and nondestructive evaluation to improve the quality, efficiency, and environmental soundness of commercial processes.

Dynamic underground stripping.

III. Bioscience: The New Frontier

We are part of an accelerating revolution in biology and biotechnology. Advances in these areas will have a profound impact on human health, on environmental management and remediation, on agriculture, and on industrial processes and products.

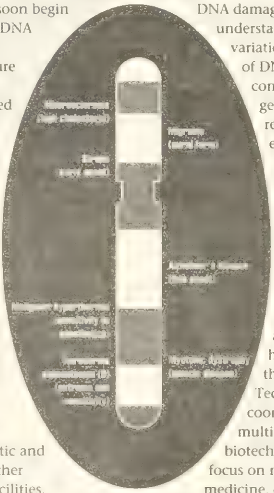
This program is a natural for Livermore. The research is inherently multi-disciplinary, drawing not only on the life sciences but also on all the physical sciences, engineering, and computing sciences. In addition, a variety of technologies not normally associated with biological research are proving central to this work, including accelerator mass spectrometry, lasers, and microfabrication. The opportunity to make truly significant discoveries that will dramatically improve the well-being of mankind, now and in the future, demands our most innovative efforts.

Our goal is nothing less than an understanding of the basic physics and chemistry of life as recorded in DNA—the genome, or master template, for an organism's genetic heritage. The knowledge gained will be applied to ameliorate, cure, or prevent disease and to improve the quality and decrease the cost of health care. The results of our human-biology efforts will also have important applications and extensions into agriculture, environmental management, and industry.

A sustainable economy requires that the demands of production and consumption be in harmony with the global environment.

The opportunity to make truly significant discoveries that will dramatically improve the well-being of mankind, now and in the future, demands our most innovative efforts.

- **Genomics.** We are engaged in an international effort to decipher the genetic code of the human genome. We have developed many of the technologies that make this endeavor possible. We have almost completed the mapping of human chromosome 19 and will soon begin work on other sections of DNA relevant to human health problems. The infrastructure developed for decoding human DNA will be applied to study the genomes of plants, animals, and microorganisms on a priority basis.
- **Structural biology.** We will unravel the three-dimensional structure of proteins and other biomolecules and will learn how these molecules interact with DNA. With this knowledge, it will be possible to design or engineer specific biomolecules. This undertaking requires an extensive array of diagnostic and analytic instruments together with advanced research facilities, many of which we have already at Livermore. Our goal is to engineer biomolecules to improve human health and the environment and contribute to a better quality of life.
- **Disease susceptibility.** We will undertake a comprehensive assessment of the effect on human health of exposures to chemicals and radiation. Methods and data developed in this assessment will lead to a science-based analysis of risk, which will facilitate important decisions regarding cost/benefit tradeoffs. With our pioneering work in genomics, coupled with state-of-the-art capabilities for detecting ultratrace levels of DNA damage, we will develop a better understanding of human genetic variation and the consequences of DNA damage. We will concentrate our efforts on the genes responsible for DNA repair, metabolism, and gene expression.



Diseases associated with chromosome 19.

- **Bioinstrumentation and health-care technology.** An integral part of our biotechnology research is the development of advanced tools and instrumentation. To focus this effort on opportunities for improving the quality and decreasing the costs of health care, we have formed the Center for Healthcare Technologies. This center will coordinate the Laboratory's multi-disciplinary efforts in biotechnology, with particular focus on minimally invasive medicine, diagnostics and imaging, microsurgical instruments, and medical information management.

We are adapting unique technologies originally developed for defense and other Livermore programs to high-priority problems in health care. In the long run, the success of this program will be measured by health problems avoided or cured, health-care cost savings, and extended benefits for other human needs.

Partnering as a Way of Doing Business

Partnering with the Department of Energy, other laboratories and government agencies, industry, and academia has become a primary mechanism for accomplishing our programmatic objectives.

The recent reduction in classified R&D presents an historic opportunity to open up the Laboratory to an increasing variety of collaborations. It is our goal to make this Laboratory user friendly and more easily accessible to the public and to the technical community. We want partnering with the Livermore Laboratory to be a compelling business decision.

The knowledge and tools developed at Livermore will be applied in both the public and private sectors. Our partnering efforts will be successful if the intended benefits are measurable by our partners and at national levels—that is, if the parties involved find that these endeavors lead to technically improved, cost-effective products; provide for more effective use of capabilities and facilities; and make significant contributions to the U.S. economy.

- **Collaborations with other laboratories.** In the future, the national laboratories must become interdependent to provide the best capability for the fewest dollars. Cooperation will be driven by a sharing of specialized research facilities to ensure their maximum utilization. The recent planning with other national laboratories and academia for the proposed National Ignition Facility is one example. The national laboratories will also collaborate through commercialization alliances, such as the emerging manufacturing and environmental technology centers. These alliances will facilitate the rapid development and transfer of technologies to private industry.
- **Partnerships with industry.** Our partnerships with industry are focusing on grand challenges—those problems whose breakthrough solutions create new markets or major shifts in existing markets. We currently have partnerships with more than 150 companies through a variety of cooperative research and development arrangements. Many companies will work with us through consortia, and the results should spread broadly through an industrial sector. We will also continue to work with individual companies and help stimulate entrepreneurial startups.
- **Collaborations with academia.** We continue to increase our many formal and informal research collaborations with the University of California campuses and other universities. By making our facilities and staff more accessible to the academic community, we have access to a larger pool of talent, which helps us to effectively accomplish our programmatic goals.

The University of California at Davis Department of Applied Sciences is located on our site. In addition, we have a dozen formally established institutes and centers that support hundreds of ongoing projects with academia. We will seek expanded participation of universities in collaborative projects and will increase the number of students and faculty engaged in research at Livermore. We want to be seen as an academic center for science and technology with nationwide access to our experimental facilities and staff.

- **Partnerships in California.** California must deal with many issues involving science and technology, such as water conservation, natural resource management, earthquakes, transportation, environmental protection, and science education. We have expertise in

Opening the Laboratory to the technical community and the public is key to effective partnering.

Partnering has become a primary mechanism for accomplishing our programmatic objectives.

many of these areas and can provide the technical basis to support effective decisions. In this way, we can serve as a cost-effective mechanism for addressing complex technical issues facing California, many of which are also challenging the nation.

- **Partnerships with other federal agencies.** Complex national issues, such as health care, the environment, and crime, increasingly require collaboration among the Department of Energy laboratories and other federal agencies. We have unique facilities (e.g., genetics, environment, and forensics laboratories) and have developed effective working relationships with the National Institutes of Health, the Environmental Protection Agency, the National Aeronautics and Space Administration, the Department of Defense, and other federal agencies. We will build upon these existing relationships and will seek new collaborations to tackle important national problems where our technical expertise can assist.
- **International partnerships.** Increasingly, many of our scientific and technological programs have an international dimension. Evidence of our increasing participation includes the International Thermonuclear Experimental Reactor program with Russia, Japan, and the European community; several hundred cooperative projects with countries of the former Soviet Union; and laser projects with France and England.

Managing Effectively in a Changing Business Environment

Our goal is to be recognized by our industrial and academic customers as a well-managed, forward-looking organization that performs world-class research and development. The challenge we face is to increase the quality of our business practices while reducing costs.

A strong partnership with the University of California, the Department of Energy, our suppliers, and others who have key roles in Laboratory operations will be critical to our success. We will strengthen team efforts to facilitate the development and implementation of the adaptable management systems we need in today's complex business environment.

Assuring a Vital Laboratory Workforce

The Laboratory's principal asset is a quality workforce. Our goal is to create a work environment second to none, one that attracts and encourages talent and diversity. Our recruitment, reward, and advancement decisions will be based on merit, with successful employees being those whose performance contributes to the Laboratory's objectives. We will recognize the importance of partnering by rewarding excellence for team as well as for individual accomplishment. We will ensure our vitality by taking pride in and responsibility for our work, by improving our skills, and by continuing our professional growth.

Our goal is to create a work environment second to none, one that attracts and encourages talent and diversity.

Managing for Quality

The Laboratory will operate through a system of quality management in an atmosphere of openness and trust. We look not only to meeting contractual and ethical standards but also to being evaluated on how well we meet or exceed our programmatic and institutional goals.

Structuring for the Future

We are structuring the Laboratory to meet our new programmatic and business goals. Matching the skills and talents of our staff to these goals will be an important component of this process. We will undertake a Laboratory-wide evaluation to define and reduce all costs of doing business. In addition, we will examine ways to increase efficiency and effectiveness, including contracting out work, simplifying procedures, decentralizing, and redeploying major functions.

Achieving Excellence in ES&H

Livermore will set the standard among major research laboratories for environmental stewardship and employee safety and health. The challenge is to achieve ES&H excellence within the cost benchmarks of the best industrial practices. Experience shows that ES&H excellence saves money through improved employee morale and worker productivity. Meeting this goal will require that we and the Department of Energy take a new look at system requirements, compliance, and regulation. We will apply science-based cost/benefit assessment as an important metric in our management of ES&H.

Opening Up the Laboratory for Effective Partnering

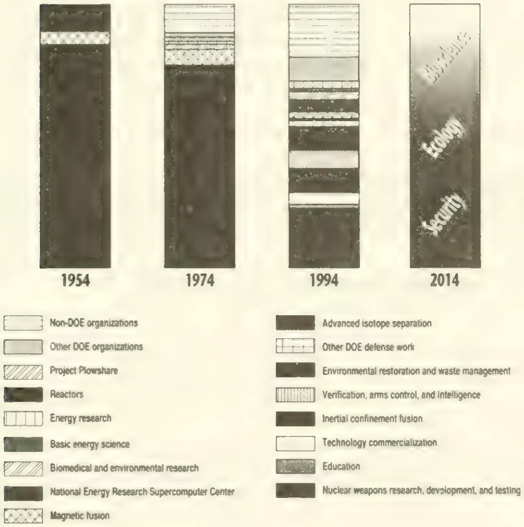
We will reconfigure the Laboratory site to make as much of the area as possible accessible to our partners and customers. We will make our people, data, and facilities more accessible through open information networks and through higher-performance networks that allow remote access to key experiments, such as the networks that are being developed among fusion energy research partners. Our goal is to make Livermore the first-choice meeting ground for blending new ideas from all our partner communities.

We want partnering with the Livermore Laboratory to be a compelling business decision.

Focus and Change

In this document we have defined our values and capabilities. Our focus for the future will be on global security, global ecology, and bioscience. We are committed to openness, partnership, and a new way of doing business. In the past, we have changed to address new national needs. Change of an even greater magnitude is demanded of us now. We will meet this challenge.

Livermore's programmatic evolution.



Our focus for the future will be on global security, global ecology, and bioscience.

National Renewable Energy Laboratory

1617 Cole Boulevard
Golden, Colorado 80401-3393
(303) 275-3000

NREL

April 12, 1995

The Honorable Steve Schiff
Chairman
Basic Research Subcommittee
U.S. House of Representatives
Suite 2320 Rayburn House Office Bldg.
Washington, DC 20515-6301

The Honorable Dana Rohrabacher
Chairman
Energy and Environment Subcommittee
U.S. House of Representatives
Suite 2320 Rayburn House Office Bldg.
Washington, DC 20515-6301

Dear Mr. Rohrabacher and Mr. Schiff:

I appreciate the opportunity to respond to the questions in your letter dated March 16, 1995. My responses are enclosed, and numbered to match the original questions, with a brief header to identify the theme being addressed.

If there is any further information you may desire, please do not hesitate to ask.

Sincerely,

Charles F. Gay

Charles F. Gay
Director

Enclosure

Response from Dr. Charles F. Gay, Director, National Renewable Energy Laboratory

to Follow up Questions Submitted by Mr. Rohrabacher

Following the
COMMITTEE ON SCIENCE

SUBCOMMITTEE ON BASIC RESEARCH
AND
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

Joint Hearing on
Alternative Futures for the Department of Energy National Laboratories
(The "Galvin" Report)
and
National Laboratories Need Clearer Missions and Better Management
(a GAO Report to the Secretary of Energy)

April 12, 1995

1. NREL's Core Competencies

NREL's primary mission is to develop renewable energy and energy efficiency technologies and to transfer those technologies to American industry. NREL has developed four core competencies in pursuit of this mission:

- *Exploration and development of renewable energy, energy efficiency and waste conversion processes and devices.*

  NREL's photovoltaics, solar thermal, wind energy and biofuels programs are recognized worldwide as centers of excellence in their respective renewable energy specialties.

  NREL's industrial technologies and building and energy systems programs are recognized worldwide as centers of excellence in industrial, residential and commercial energy efficiency technologies.

  NREL's industrial technologies and alternative fuels programs are recognized worldwide as centers of excellence in economic waste-to-product conversion processes using advanced thermochemical and biochemical techniques.

- *Advanced materials science, engineering and characterization*

  NREL's basic sciences and analytic studies programs are recognized worldwide as centers of excellence in design, fabrication and characterization of electronic materials and devices, and in energy usage and generation analyses.

- *Systems and process engineering and integration*

  NREL provides advanced systems integration and technology implementation guidance to its industrial partners.

- *Partnerships for market and technology development*

  NREL provides a forum for bringing together analysts, scientists, engineers, economists, manufacturers and customers to accelerate the impact of energy efficiency and renewable energy technologies on America's national security, economic prosperity, and technological competitiveness in the international marketplace.

2. Listings of Industry and University Partners

Two listings of NREL's numerous industrial and university partners are attached.

A list of NREL's Cooperative Research and Development Agreement (CRADA) partners is attached as Appendix A.

A list of NREL's R&D subcontractors and the amounts of their cost-sharing is attached as Appendix B.

3. Hand-off of Technology to Industry

NREL is focused on the exploration of innovative energy efficiency and renewable energy technologies and the acceleration of the evolution of viable technologies from the early stages of research and development to the point of commercial *opportunity*. When a technology has advanced near to the point of early-stage commercialization, it is appropriate for the technology to be handed-off to private enterprise, to flourish or perish in the competitive marketplace.

A technology is typically licensed to industry when a suitable potential industrial licensee is found. Nonexclusive licenses are typically granted in those cases where a technology is so fundamental and sweeping in its extent that it in effect gates others' entry into the field, or when a technology is useful primarily as an enhancement to others' proprietary processes, materials or structures. Exclusive licenses are typically granted when nonexclusive licenses are not feasible or advantageous, for example in those cases when a technology is sufficiently different from that of other market participants to provide a significant competitive advantage and when the degree of competitive advantage needed to attract the necessary investment capital can only be secured with the granting of exclusive rights.

A technology is typically spun-out as a standalone business when the technology is relatively self-contained and has advanced to the point near early commercialization. Such situations are typically characterized by:

- The technology development program has evolved beyond the basic research and proof-of-concept phases to the pilot-scale manufacturing phase.

- The economics of the process are thoroughly understood, and the prospects are attractive to financing sources.

- The technology serves a market of substantial size.

- Strategic partners are available to provide technology synergies and market access for the new venture.

- Key technical personnel are available and committed to the venture.

- Intellectual property rights providing maximum competitive advantage are secure.

NREL is working now to better define an aggressive new technology transfer paradigm incorporating these hand-off options. We expect to have a significant new test-case proposal for review in September.

As I mentioned in my testimony of March 9, NREL is also introducing a new "sunset" review process through which a technology development project can be determined to have become a success that should be spun-off to private industry, or to be objectively recognized as a lower-performing investment that must be terminated. The sunset review process will establish a specific schedule of milestones for technology advancement for each technology under development and will define criteria for when NREL should seek to hand off the technology to industry. If a technology fails to advance at an acceptable pace or if it is determined that U.S. industry is not likely to commercialize the technology, then NREL will redirect resources previously directed at that technology to other more productive activities. Suitable checks and balances will be instituted to assure that such decisions are not made prematurely for promising technologies. The process and exact criteria are still being defined. We expect to have this process in place by late summer.

4. Nurturing versus Subsidy

The nation's investment in NREL's nurturing of the renewable energy technologies industrial base can be judged like any other national investment - how can NREL best interact with private industry to assure that the taxpayers' investment in energy technologies leads to the type of large-scale implementation necessary to materially benefit the nation's economy, security, and quality of life, while at the same time avoiding any unwarranted interference with the efficient workings of the marketplace?

A clear demarcation point between nurturing and subsidy occurs when a technology advances beyond the appropriate limits of government-funded research and development. Briefly stated, I believe that there are four arenas in which government-funded research is appropriate:

- *Fundamental Research*
  Basic science and engineering research in materials, processes and structures are appropriate targets for government funding.

- *Long-term Research and Development*
  Unlike private business that increasingly must focus near-term return, government is charged with the well-being of both its present and future citizens and institutions. Hence government is able to consider the longer-term planning horizons necessary to develop significant new energy sources.

- *Activities Requiring Major Investments*
  Some research and development activities require major investments in complex equipment and highly-skilled workers beyond the reach of any corporation given the risk-adjusted expense and benefits. For example, NREL's National Wind Test Site provides the equipment and expertise required for critical full-scale destructive testing of wind turbine blades for companies and customers who might otherwise not be able to cross the threshold of initial commercial investment.

- *Research Activities in the National Interest Without a Clear Basis for Individual Competitive Advantage*

  Fundamental and high-risk research that is critical for collective industrial progress but that does not provide a clear basis for individual competitive advantage is being under funded by industry in today's competitive business environment. Research aimed at assuring the long-term competitiveness of American industry is in the national interest and warrants government funding.

The energy efficiency and renewable energy research being done at NREL and at NREL's outside subcontractors meets these criteria for government funding.

When a technology has matured to the point where it could be commercialized, then it is appropriate to hand-off the technology to the competitive marketplace. When a technology has been handed-off to the competitive marketplace, then it is appropriate only to continue directly supporting that technology to the extent that it is victimized by non-market forces (e.g., unreasonably restrictive regulation or unfair foreign trade barriers).

A continuing role for government investment might be in advanced fundamental research in allied fields; however, the burden of commercializing a viable new technology falls squarely on the shoulders of industry and the investment community. The burden of terminating government investment in less-promising technologies is the responsibility of the national labs tasked with maintaining expertise and world-class leadership in specific technological fields. NREL is prepared to make the difficult choices of when research in a poorly-performing technology must be terminated in order to assure the highest return on the taxpayers' investment in energy research. We are in the process of developing clear "sunset" criteria to objectively make these choices.

Renewable energy technologies are sufficiently promising to our nation's future that we as a nation should not prematurely and rashly cut funding to these valuable technologies, or we risk finding in a very few years our foreign competitors again reaping the economic benefits of research advances initiated in America but reduced to commercial reality elsewhere.

A listing of start-up companies with direct lineage to NREL is attached as Appendix C.

5. Division of Labor

a. I share the Galvin Task Force's belief that there must be an appropriate division of labor between the national laboratories, industrial research institutions, and research universities.

b. I believe that universities should focus on fundamental sciences and engineering and on educating skilled scientists and engineers. Industry finds that it can no longer afford to invest in fundamental research, and neither industry nor national laboratories are an adequate training ground for future generations of America's technologists.

National laboratories should focus on high-risk, exploratory research and development tasks that promise to substantially impact the national interest. Universities are generally not well-suited to large-scale, multifaceted projects, and industry finances cannot adequately support such high-risk, long-term undertakings.

Industrial research institutions should focus on applied research and development with the express aim of advancing technologies to market. Universities and national laboratories are not directly suitable for technology commercialization.

Given the breadth of the activities of the Department of Energy, it is difficult to provide one general comment which properly balances the division of labor between the DOE's national labs, industry and universities. However, in general the national labs are well positioned to conduct the long-term, high-risk research and development necessary to develop new large-scale energy sources. I do believe that careful scrutiny should be given to the division of labor at the weapons labs, portions of whose missions have been made obsolete and/or redundant by changes in international geopolitics.

In the specific case of NREL, I believe that the division of labor between NREL and its industrial and university partners is in reasonable balance and our external review panels have supported this view. In FY 95 NREL formed collaborative teams of researchers from NREL and its university and industry subcontractors. This team structure seeks to accelerate the pace of progress in specific aspects of our mission by better leveraging the complementary strengths and foci of national lab, university and industry research.

6. Greater Integration

a. I concur with the general thrust of the Galvin Task Force's statement that greater integration of the DOE's various applied and fundamental energy R&D programs will be a great challenge. However, it is not a challenge that I would recommend that the DOE take up without careful consideration.

There are certain synergies that might accrue from greater integration. For example, NREL has a quite successful program to develop thermochemical and biochemical processes to cost-effectively derive ethanol from non-food and waste biomass. Integration of this program with the DOE's fuel cell programs might yield some synergistic advantages.

Similarly, the complementary aspects of different energy technologies might become more widely apparent if energy research programs were more integrated. For example, electric utilities are using photovoltaic systems today to offer cost-effective service to customers who are located in their service territories, but who are far from the utility's existing power lines. Rather than viewing photovoltaics as an economic threat to the utilities' other existing power generation sources, utilities are now recognizing the profit opportunities and service convenience of photovoltaics. Greater integration of energy research activities might accelerate this cross-fertilization and recognition of complementary aspects.

Thus, greater integration might yield synergies and a greater recognition of the advantages of energy source diversity.

However, greater integration might erode diversity and complicate Congressional oversight of America's investment in energy research. Different energy technologies (e.g., renewables, fossil fuels, nuclear fission, nuclear fusion, etc.) are at different points in their maturation as industrial processes and have fundamentally different characteristics that complicate management by a single, integrated management structure. For example, advanced oil recovery techniques could have an immediate, though temporary, impact on America's energy supply and economy. Conversely, nuclear fusion would likely require many years of additional research before yielding a commercial reactor, but if successful might provide power for centuries. As another example, nuclear fission power plants are typically designed in ca. 1 GW sizes to provide regional power that is distributed via conventional power grids. Conversely, while photovoltaics can be centralized into large arrays, it is also suited to providing power to isolated Developing Country dwellings, achieving economies of scale by installing multitudinous small, local, standalone power systems.

The optimal management strategies for such different energy technologies are likely quite different, such that greater integration of DOE's energy research activities might impede the forward progress of some or all of the diverse technologies needed to assure America's energy future.

Separate line management of different energy technologies also simplifies the oversight role of Congress by delineating clear budgetary targets and facilitating budgetary monitoring. In other words, separate programs simplify your job of getting the taxpayers' investment to the desired activity and of measuring the return on that specific investment.

b. The advantages of greater integration might be more easily achieved by the consolidation of the Assistant Secretary functions, but it is likely that the additional complexity of balancing divergent technology stakeholder groups would more than offset any gains. I would favor tabling this issue until DOE has had a chance to plan and present its proposed Strategic Realignment.

7. Highest Priority Research Areas

I share the Galvin Task Force's belief that energy efficiency and renewable energy sources are among this country's highest priority research areas.

It is prudent for the nation to have a balanced energy research program that includes leveraging near-term improvements and promising long-term innovations. Conservation and energy efficiency are economic now in many cases, and, barring regulatory impediments that might result from, say, poorly implement utility deregulation, conservation and energy efficiency should be self-sustaining in the marketplace and require only modest ongoing investment. Enhanced oil and gas recovery are pragmatic near-term investments in maximizing the gain from our finite fossil fuel resources; there is little merit in failing to access recoverable oil and gas in existing wells. Renewable energy technologies are in a transitional phase with some (e.g., wind, geothermal and off-grid photovoltaics) being economically viable today, and others (e.g., biomass, on-grid photovoltaics, hydrogen) progressing steadily toward economic viability.

I fully support a diversified investment portfolio of national investment in conservation, energy efficiency, enhanced fossil oil and gas recovery, and renewable energy.

However, I believe that past and present subsidies to the nuclear energy industry are distorting energy economics and utility deregulation in this country, and are inhibiting the workings of the energy marketplace. I would counsel caution in investing significant further public funds in nuclear technologies.

8. Spreading the Wealth versus Concentrating Resources

I cannot speak authoritatively on the general issue of historical funding allocations between DOE national labs, but I strongly concur with the critical importance of concentrating resources at individual Centers of Excellence. My experience in industrial research and development, and indeed in any aspect of business management, is that one is far more likely to fail due to a lack of a critical mass working on any given task, than to fail for having chosen the wrong tasks on which to focus. Given a prudent diversity in government-funded research in energy technologies, it is imperative that sufficient funds are concentrated at individual labs to achieve technology-specific Centers of Excellence.

NREL is America's present Center of Excellence in energy efficiency and renewable energy technologies, and it should be allocated sufficient resources to continue to fulfill its mission.

9. Isolation and Entitlement at the Laboratories

a. As a taxpayer and a veteran of industry, I strongly agree with the general sentiment embodied in the Galvin Task Force's statements about isolation and a sense of entitlement at some laboratories. A small anecdotal story serves to illustrate my own experience. While in industry I received inquires from national lab personnel that suggested to me that they were looking for useful tasks to do, perhaps at no charge to the industrial partner, but in truth at significant cost to the nation.

Since the release of the Galvin and GAO Reports on the recommended priority tasks for the DOE national labs, I have encountered, from outside of NREL, a host of newly self-proclaimed experts in energy efficiency and renewable energy technologies. As with Question # 8, this is first and foremost a matter of continuity and critical mass in maintaining NREL as the nation's Center of Excellence in renewable energy technologies. But it also reflects a sense of entitlement that has permeated much of government and society, well beyond the DOE national labs.

b. Specific to NREL, I detect no significant loss of vitality in the research efforts. NREL researchers work closely with industry, universities, government agencies, international trade and financing groups, and other labs.

However, I have frankly described to you opportunities that I am addressing to improve the operational efficiency of NREL, reversing what I perceive to be vitality-suppressing structural and procedural impediments that evolved over time. I encourage you to empower and embolden all directors within the National Laboratory system to take similar action in their respective organizations.

10. DOE Personnel Reductions

a & b. It may be possible to radically reduce DOE's overall headcount without materially harming the priority elements of mission performance, provided that a critical mass is retained in the highest priority research areas.

It would be difficult to maintain a credible energy efficiency and renewable energy technology research program in the United States if NREL's headcount were cut by a factor of 2 - 3. NREL is currently reviewing the reductions achievable through improvements in operational efficiency and mature technology spin-outs, but it is not yet possible to fully quantify these potential gains. As I mentioned in my testimony of March 9, NREL recently embarked on a process of review and restructuring to increase its operational efficiency. I expect to be able to present an improved operations framework and the associated estimated cost reductions by June.

I can give no specific recommendations today on overall DOE personnel cuts or specific cuts outside of NREL.

11. DOE Management Layers

The DOE is undertaking a self-review in the form of its Strategic Realignment, which the Secretary described at the March 9 hearing. We expect that this review will result in greater delegation of responsibility to the labs, the elimination in certain redundancies, and the reduction in compliance-driven procedures and paperwork. We welcome this increase in accountability. We do not have sufficient data at this time to estimate how much money might be saved as a result.

12. Specific DOE Management Practices

In general, NREL could improve the efficiency of its operations if DOE were to delegate greater authority and autonomy to the labs. We desire the authority to define and implement efficient business practices appropriate to the particular activities of NREL. We are willing to directly bear the burden of normal value-added business costs, but we believe that it is inappropriate for the labs to pay for additional, unnecessary reporting, reviews, audits, etc.

We recommend that the following specific DOE management practices be altered to improve NREL's efficiency:

- Eliminate the specificity of requirements within Management and Operations (M&O) contracts. Allow the M&O contractors and labs the flexibility to use "best business management" practices wherever possible and appropriate in financial and administrative areas.

- Extend the "best business management" practice concept to procurement while maintaining strict adherence to legal requirements.

- Allow the labs to use best industrial standards and regulations (e.g., typical industrial lab Environmental, Safety and Health practices) wherever possible and appropriate, and apply rules and regulations in a manner consistent with the risk.

- Apply rules and regulations more consistently from laboratory to laboratory.
- Eliminate redundant hierarchial approvals needed to accomplish any given task.

13. Fraction of Budget to Scientists in the Lab

Approximately 66 ¢ out of each dollar appropriated to NREL reaches the scientists conducting research.

NREL has an annual spending level of $228 million. This is apportioned as follows:

- Internal R&D Activities - 39%

  This category includes the variable costs that researchers can generally control. We have included direct labor and fringe burden, operating supplies, capital equipment, publications, metrology and the like. We also include the allocated costs for procurement services, facility costs directly attributable to space occupied by the research group and for the Director's Development Fund to pursue new initiatives. Also included are intellectual property support services required by the researchers.

- Subcontracted R&D - 48%

  This category includes subcontract costs that researchers can also generally control. We have included costs for the contracts and for costs associated with negotiation and contract administration.

- Indirect Support - 14%

  This includes various fixed costs. Such costs encompass the controller's office, planning and external affairs, legal services and other administrative costs in addition to general property, plant and equipment needs, general purpose equipment costs not readily allocated to specific functions and administrative capital equipment purchases.

Appendix A

Major NREL Stakeholders

CRADA Partners

Allied Signal:
Wayne Rupert
AlliedSignal, Inc.
Legal Department
P.O. Box 31
Petersburg, VA 23804

Allied Signal contribution:	$3,440,000
DOE contribution:	2,990,000

NREL has developed a concept for the selective pyrolysis of waste carpets containing nylon-6 in the presence of other carpet components. Carpets contain, in addition to nylon-6 fibers, materials such as polypropylene, dyes, latex, and inorganic fillers. The NREL selective pyrolysis technology has been shown to allow preferential nylon-6 depolymerization to its building block, caprolactam, through coupled pyrolysis/catalysis, while the backing materials remain largely unchanged. Recoveries of 70-85% of caprolactam based on the starting content of nylon-6 in the carpet or synthetic mixtures have been obtained in batch or in flautist bed reactors at scales of 1000 g/h or less. An independent preliminary technoeconomic assessment carried out by A.J. Power and Associates suggests that this process will be cost effective and energy efficient.

Amoco:
Robert D. Hall
General Manager
Amoco Corporation
Mail Station E-2G
P.O. Box 3011
Naperville, IL 60566-7011
708/420-5169

and Bob Walker
708/420-5169

Amoco contribution:	$25,280,000
DOE contribution:	$4,126,000

Support work on a novel technique for producing ethanol from the cellulose in waste paper. Cellulose is the primary constituent of trees and grasses, even yard and paper waste. The NREL ethanol production method offers the potential of using these abundant, domestic, renewable feedstocks to produce alternative transportation fuels. A pilot scale facility was constructed at NREL to demonstrate the process which uses enzymes to break down cellulose into sugars that can be converted to ethanol.

Astropower:

Dr. Allen Barnett	and Jim Rand
President	302/366-0400

AstroPower
30 Lovett Ave.
Newark, DE 19711
302/366-0400

Astropower contribution:	$100,000
DOE contribution:	$100,000

The development of low-cost silicon film growth processes that can be used for the fabrication of silicon layers suitable for use in photovoltaic electric power applications. The combined NREL and AstroPower effort should be useful for improving the properties and PV device performance of thin silicon layers grown on low-cost substrates. Growth of thin silicon layers on substrates has good potential for economical PV systems, but a number of process-specific problems not present in conventional thick silicon wafer PV devices arise due to the presence of the substrate and the need for light trapping in the devices.

Brush-Wellman:

Mr. Jere Brophy and Terry Thomas
Brush-Wellman Inc.
17876 St. Clair Street
Cleveland, OH 44110
216/383-4096

Brush-Wellman contribution:	$675,000
DOE contribution:	$685,000

This collaborative effort is to demonstrate that concentrated solar flux can be used to produce high quality metallized ceramic components which meet specific technical requirements. The process uses NREL's Solar Furnace to lower the cost and improve the production of widely used electronic devices. Once technical feasibility of the process is demonstrated, then an additional development program to demonstrate the process at a pilot scale will be considered.

Coors Ceramics:

Dr. David G. Wirth	and Dean Rulis and Jack Sibold
Vice President R&D	Dean - 277-4545
600 Ninth Street	Jack - 277-4441
Golden, CO 80401	
277-4747	

Coors Ceramics contribution:	$1,533,000
DOE contribution:	$1,167,000

Coors Ceramics is currently purchasing most of its silicon carbide powders from a German supplier and would like to obtain a reliable domestic powder supply that would lead to vertical integration of their entire ceramics production process. The development of a less expensive method for ceramic powder production, specifically, sub-micron silicon carbide in the $1-3/lb range, would greatly expand the market for these powders. NREL has responsibility through its DOE-funded programs for maximizing energy efficiency in industrial processes. NREL also has a commitment to improving the competitiveness of domestic industries relative to foreign competition.

Colorado State University:

Dr. Doug Hittle
Mechanical Engineering
Colorado State University
000 Solar Engineering House #2
A 219 Engineering
Ft. Collins, CO 80523
303/491-6355

Colorado State University contribution:	$300,000
DOE contribution:	$400,000

This CRADA is to develop and refine the procedure and computer software needed for a performance test that could help improve the energy efficiency of a home or office. This test is designed to measure how efficiently a building uses energy. Architects, builders, and occupants can use this test to gauge if a home or office and the installed heating, ventilating, and air-conditioning systems are as energy efficient as they were designed to be.

Crystal Systems, Inc.:
Chandra P. Khattak, Ph.D.
Executive Vice President
Silicon Operations and R&D
27 Congress St.
Salem, MA 01970

Crystal Systems, Inc. contribution:	$155,000
DOE contribution:	$147,000

The Heat Exchanger Method has been successfully used for growing sapphire and single crystal silicon. This technique has recently been applied for casting large ingots of large-grain polycrystalline silicon for photovoltaic applications. The material grown by this technique has already produced small-area (1 cm x 1 cm) solar cells of 17% AM1.5 efficiencies. Further improvements in the cell efficiency and reduction in the material cost are necessary. The benefit to DOE include improved understanding of silicon materials properties and the acceleration of industrial PV processes consistent with the NREL and DOE technology-transfer mission.

Eclipse Energy Systems, Inc.
Jay Wolfington
13902 North Dale Mabry Highway, Suite 225
Tampa, FL 33618

Eclipse Energy Systems, Inc. contribution:	$204,000
DOE contribution:	$187,458

The purpose is develop and commercialize the production equipment and processes necessary to coat polymer surfaces with switchable electrochromic films for various types of commercial window applications. The benefit to DOE is the commercialization of a DOE-sponsored technology which has the capability to dramatically decrease energy use in the United States. Further, the technological advances made during the program will greatly enhance the United States' competitiveness in other applications of thin film technology.

General Electric:

Harley Lake
G.E. Company, #C-258
Building K-1, Room 2C1
Schenectady, NY 12309
518/387-6378

General Electric contribution:	$50,000
DOE contribution:	$50,000

NREL and GE are both interested in the development of a low-cost deposition process that can be used for the fabrication of superconducting tapes suitable for use in electric power applications. The combined NREL and GE effort should provide the ability to produce a long-length High Temperature Superconducting (HTS) conductor using a "thick film" processing approach. This method is viewed as a viable alternative to the mainstream powder-in-tube development with the recent demonstration of high critical current density for short sample thick films.

General Electric #2:

Debra L. Avellino
Contract Administrator
General Electric Company
Bldg. KW, Room C247
P.O. Box 8
Schenectady, NY 12301

General Electric contribution:	$50,000
DOE contribution:	$50,000

This is the second CRADA with the General Electric Company. NREL and GE are both interested in the development of a low-cost deposition process that can be used for the fabrication of superconducting tapes suitable for use in electric power applications. The combined NREL and GE effort should provide the ability to produce a long-length High Temperature Superconducting (HTS) conductor using a "thick film" processing approach. This method is viewed as a viable alternative to the mainstream powder-in-tube development with the recent demonstration of high critical current density for short sample thick films.

Golden Technologies Co.:

Jean Diener and Jeff Coors
Manager, R&D Projects
Golden Technologies Co., Inc.
P.O. Box 329
Golden, CO 80402
271-7441

Golden Technologies contribution:	$10,423,000
DOE contribution:	$1,588,000

This is the second CRADA with the Coors Company. This cooperative work agreement for lactic acid production from renewable resources is discussed in three phases: the first consists of a "Base Case Review" of engineering and microbiology work underway at Golden Technologies Company, the second describes an integrated bench-scale production unit, and the third includes a semi-works scale unit.

IST/Federal Bureau of Prisons:

Chuck Coburn
Federal Bureau of Prisons
320 First St., NW
Washington, DC 20534

George Allen
Industrial Solar Technology Corp.
5771 W. 52nd Ave.
Denver, CO 80212

Industrial Solar Technology Corporation/ Federal Bureau of Prisons contribution:	$1,100,000
DOE contribution:	$650,000

The Federal Correctional Institution in Phoenix, Arizona, will supplement its hot water supply by a cost-effective solar-thermal system. The project is a technology demonstration sponsored by DOE's Federal Energy Management Program (FEMP), whose mission is to assist federal agencies to reduce energy use. The project will also demonstrate the use of an innovative financing/procurement mechanism known as energy savings performance contracting. Environmental benefits include reductions in pollutants and carbon dioxide in an amount equal to the conventional energy displaced by the solar system.

IT Corporation:

Robert D. Fox
Vice President
IT Corporation
312 Directors Drive
Knoxville, TN 37923
615/690-3211

IT Corporation contribution:	$250,000
DOE contribution:	$245,000

NREL's Solar Industrial Program has been researching photocatalysis for waste treatment since 1989. The laboratory's objective has always been the development of the technology, particularly using solar ultraviolet light, for commercial applications. This CRADA brings together NREL's fundamental knowledge of the technology with ITC's process development and marketing skills, a combination that should greatly enhance the potential for successful commercialization of gas phase photocatalytic oxidation.

Labsphere:

Kevin Carr
Labsphere, Inc.
P.O. Box 70
North Sutton, NH 03260
(603) 927-4266

Labsphere, Inc. contribution:	$170,000
DOE contribution:	$70,000

NREL has developed the Scanning Defect Mapping System (SDMS) as a compact, high-speed instrument for mapping dislocation density and grain boundary distribution in large-area commercial single and polycrystalline silicon. The capabilities of this system were extended for solar cell characterization to include parameters such as Light Beam Induced Current (LBIC) and reflectance (both specular and diffuse). The objective of this CRADA is to allow Labsphere to improve the technology and expedite commercial manufacturer of this instrument.

Lockheed Missiles and Space Company, Inc.
1111 Lockheed Way
Sunnyvale, CA 94086
(408) 742-8134

Lockheed Missiles and Space Company, Inc. contribution:	$220,000
DOE contribution:	$0

The Heat Exchanger Method has been successfully used for growing sapphire and single crystal silicon by Crystal Systems, Inc. This technique has recently been applied for casting large ingots of large-grain polycrystalline silicon for photovoltaic applications. The materials grown by this technique has already produced small-area (1 cm x 1 cm) solar cells of 17% AM1.5 efficiencies. However, further improvements in the cell efficiency and reduction in the material cost are necessary to improve HEM multicrystalline material as a commercial product for solar cell substrates.

Martin Marietta:
James Bradley
Martin Marietta Astronautics
P.O. Box 179
MS 4234
Denver, CO 80201

Martin Marietta Technologies, Inc. contribution:	$112,000
DOE contribution:	150,000

The collaboration is to develop a low-cost process for manufacturing thin-film solar cells that have potential markets in both terrestrial and space applications. The goal is to reduce the cost of manufacturing the solar cells by using a process that rapidly deposits thin, uniform layers of CIS material over large areas. In addition, NREL will assist Martin Marietta in developing a facility to measure the performance of thin-film CIS solar cells and modules.

New Energy Company of Indiana:
Victor Shaio and Larry Russo
Chairman & President
999 Summer St.
Stamford, CT 06905
203/359-3820

New Energy Company contribution:	$1,781,200
DOE contribution:	$1,289,349

Using technology developed at NREL, New Energy is squeezing more fuel from the corn it processes into ethanol at its Indiana facility. Currently, ethanol is processed from corn starch, which makes up less than 75% of the kernel. The corn fiber, protein, and other materials are left over and made into animal feed supplements. NREL researchers have developed a method to convert the corn fibers - cellulose, hemicellulose and lignin - to sugars, which can then be fermented and processed into ethanol. Researchers estimate the corn fiber-to-ethanol process will increase ethanol yields by 13%. New Energy Company is building a pilot plant that uses the NREL technology.

Otter Tail: Roger Davis
Reuter, inc.
410 11th Avenue South
Hopkins, MN 55343
612/935-6921

Terry Graumann
Otter Tail Power Co.
215 S. Cascade St.
Fergus Falls, MN 56538

Peter Brown
XL Disposal Cor.
13701 S. Kostner
Crestwood, IL 60455
708/389-6312

Participants' contribution:	$135,580
DOE contribution:	$172,400

Participants include Otter Tail Power Company, Argonne National Laboratory, Green Isle Environmental Services, and XL Disposal Corporation.

This CRADA will generate electricity from garbage. The unique method of turning garbage into power may also help reduce one type of air pollution produced in standard coal-fired power plants. The CRADA involves research that turns the ordinary trash in landfills into small pellets that can be burned along with coal in a power plant to produce electricity.

Pacific Gas & Electric Company:

Carl Paquin
PG&E
3400 Crow Canyon Road
San Ramon, CA 94583

Pacific Gas and Electric Company contribution:	$485,000
DOE contribution:	450,000

In pursuit of its goal of reducing the cost of electricity from various geothermal resources, DOE is conducting investigation to improve the performance and economic viability of geothermal power cycles. This CRADA is to develop field test equipment and test data which will quantify the potential heat-transfer performance and non-condensable gas handling characteristics of these advanced condenser concepts. These condenser developments will be applicable to all steam power plants using direct-contact condensers, with a potential for improvement of plant heat rate by as much as 5%.

Red Hill:

Russ Tenney
Red Hill Geothermal, Inc.
480 W. Sinclair Rd.
Calipatria, CA 92233
619/348-4000

Red Hill contribution:	$100,000
DOE contribution:	$100,000

This CRADA highlights geothermal technology that uses several different approaches to tap the enormous amount of energy stored in the hot fluids, rocks and magma inside the Earth. In one technology, pressurized brines, hot fluids containing dissolved methane gas and minerals, are pumped to the surface. The brine is run through a heat exchanger where the heat is transferred to another liquid, which drives a turbine to generate electricity. Under the CRADA, Red Hill Geothermal will test a low-cost, corrosion-resistant pipe lining that could greatly reduce the cost of the heat exchange system used in extracting energy from brines.

Rockwell:

Dr. Richard L. Gay, Manager
System Test & Chemical Processing
Rocketdyne Division
Rockwell International Corp.
6633 Canoga Ave.
Canoga Park, CA 91303
818/586-6110

Rockwell contribution:	$2,800,000
DOE contribution:	$1,650,000

This CRADA makes incineration of hazardous wastes a much more environmentally friendly process. The project is to develop a molten-salt oxidation process for eliminating the toxic gases, smoke and particulate that are emitted into the atmosphere when hazardous wastes are incinerated. In an incinerator, most hazardous material is destroyed in the primary phase with the particulate and gases from combustion going to a secondary incineration process. Most, although not all, of the particulate and gases are destroyed in the second phase with the remainder being emitted to the air. The molten salt oxidation process, which researchers believe can destroy more of the toxic materials, would replace the secondary phase.

R.W. Beck (INEL):

Idaho National Engineering Laboratory
Solid Waste Integrated Systems Corporation
R.W. Beck
1125 17th St., Suite 1900
Denver, CO 80202
(303) 299-5245

Participants include: R.W. Beck, Idaho National Engineering Laboratory (INEL), Solid Waste Integrated Systems Corp.

R.W. Beck contribution:	$25,990
Solid Waste Integrated Systems Corp. contribution:	$20,000
INEL contribution:	$50,000
NREL contribution:	$25,000

NREL is a participant in this CRADA with the Idaho National Engineering Laboratory. This CRADA is to reduce trash by increasing electricity. The benefits of this CRADA to DOE is to determine the compatibility of pelletized paper for fuel, mechanical fuel handling systems, and to determine the impact of using this fuel on programmatic concerns such as environmental compliance and waste minimization. The test burn will demonstrate the suitability to utilize paper pellet fuel, and also show the viability of the Coal Fired Steam Generation Facility as a user resource facility for conducting test burns and alternate fuel research.

SEMATECH, Inc.:
Bob Falstad
SEMATECH
2706 Montopolis Dr.
Austin, TX 78741-6499

SEMATECH, Inc. contribution:	$206,950
DOE contribution:	$200,100

This project specifically focuses on the development of a photocatalytic oxidation process to abate VOC air emissions from semiconductor fabs both for point-of-use and end of pipe applications. Photocatalytic oxidation uses a photochemical reaction rather than a thermal process to destroy harmful contaminants. Either natural sunlight or artificial ultraviolet light can be used to activate a catalyst, thus initiating the oxidation/reduction process.

Sierra Research:
Jay Jayadev
Sierra Research
1132 Little Oak Cir.
San Jose, CA 95129
408/996-9387

Sierrra Research contribution:	$100,000
DOE contribution:	$100,000

This CRADA is to develop and fabricate superconducting materials for an innovative solid-state cooler. Superconductors can transmit electricity without resistance. The device has potentially important advantages over mechanical cooling technologies because its solid state concept involves no moving parts. It could help the development of more efficient electric utility equipment operating at low temperatures, as well as extremely sensitive, compact satellite links supporting an 88-million user market for direct home and business communications. The cooler could have far-reaching applications, both on earth and in space.

Solar Cells, Inc.:

Dr. Peter V. Myers
Solar Cells, Inc.
1702 N. Westwood Ave.
Toledo, OH 43615

Solar Cells, Inc. contribution:	$57,425
DOE contribution:	$59,050

The CRADA is divided into two tasks. Task 1 focuses on the effect of chemical modification procedures on the CdTe surface as it relates to ohmic contact formation, and the fabrication and characterization of alternate ohmic contact structure which are of sufficiently low resistance, stable, and manufacturable. Task 2 consists of developing and assessing the performance of a photoluminescence based quality control monitor, which can be used in a production environment for thin-film CdTe/CdS photovoltaic devices.

Spectrolab, Inc.:

Russ Tolle
Spectrolab, inc.
12500 Gladstone Ave.
Sylmar, CA 91342-5373
(818) 365-4611

Spectrolab, Inc. contribution:	$283,020
DOE contribution:	$0

This is a funds-in only CRADA. The principle objective of this CRADA is to transfer the $GaInP_2$/GaAs solar cell into a high throughput MOVPE reactor using NREL's expertise in the design, fabrication, measurement, and analysis of the $GaInP_2$/GaAs dual junction solar cell to facilitate this transition. The $GaInP_2$/GaAs dual junction solar cell is being developed for space applications. A comprehensive testing system is necessary for developing and maintaining a high quality product/process, and NREL will assist Spectrolab in the design of equipment and procedures for cell measurement systems. This CRADA will assist the PV program in its mission of helping U.S. industry develop PV technology for large-scale generation of economically competitive electric power in the United States.

Texas Instruments:

Dr. Jules D. Levine
Texas Instruments
Solar Program Associate Manager
Metallurgical Materials Division
P.O. Box 655012, M/S 35
Dallas, TX 75265
214/995-5616

Texas Instruments contribution:	$275,000
DOE contribution:	$325,000

The agreement is the first CRADA the laboratory signed with the photovoltaic industry and could accelerate the commercialization of Texas Instruments' Spheral Solar™ technology. The agreement allows Texas Instruments to optimize their unique process of upgrading metallurgical-grade silicon to a purity and electronic quality suitable for solar cells. Metallurgical silicon is of a lower quality than the semiconductor grade silicon used in solar cells currently on the market, but is far less expensive to produce. Texas Instruments will use the material to fabricate an innovate sphere-shaped solar cell. NREL will determine the change in the materials resulting from each step of the process.

UniSil Corporation:

Chuck Tolan
UniSil Corporation
405 National Ave.
Mountain View, CA 94043
(415) 962-0700

UniSil Corporation contribution:	$212,554
DOE contribution:	$0

This is a funds-in only CRADA. This CRADA is to investigate the development of silicon float zoning technology for use in a variety of applications, such as high power switching devices, infrared detectors, and high efficiency photovoltaic devices. In this CRADA, NREL will provide assistance to UniSil in silicon float-zoning technology and materials characterization in order to hasten the achievement of manufacturing readiness for float-zoned silicon in the U.S.

UTRC:

Harmon Leete
Counsel
United Technologies Research Center
East Hartford, CT 06108
203/727-7720

United Technologies Research Center contribution:	$150,000
DOE contribution:	$150,000

This CRADA will improve indoor air quality. This project will explore the use of ultraviolet light and photocatalysts in destroying a class of indoor air pollutants called volatile organic compounds (VOCs). Important indoor VOCs include such substrates as environmental tobacco smoke, formaldehyde from adhesives, toluene from paints and solvents, and vapors from new carpets. The CRADA partners will test and evaluate different photocatalysts – materials that destroy contaminants through a chemical action initiated by light. They will also establish guidelines for designing a prototype photocatalytic reactor and testing it on a recognized "sick" building.; The device would be connected to a buildings heating and ventilation system. Aside from applications in residential and commercial buildings, the device could clean the air in other types of enclosed spaces as well, including aircraft cabins, commercial shipping containers, and submarines.

UTRC2:

Art Kesten and Jim Freihant
United Technologies Research Center
East Hartford, CT 06108
203/727-7337

United Technologies Research Center contribution:	$572,500
DOE contribution:	$100,000

This is the second CRADA with UTRC concerns indoor air pollution. The CRADA examines photocatalytic oxidation for the removal of VOCs in indoor air with an emphasis on commercializing the technology.

USABC:

John Williams and Damian Porcari, 313/845-5101
United States Advanced Battery Consortium
30200 Mound Rd., Box 9010
Warren, MI 48090-9010

United States Advanced Battery Consortium contribution:	$1,673,000
DOE contribution:	$1,673,000

The CRADA involves the advanced insulation for new high-performing batteries needed for electric cars. The program has as its goal the development or advanced batteries that can make widespread use of electric cars feasible by the year 2000.

USABC #2:

Bernard F. Heinrich and Norm Thorpe, 313/974-1628
USABC Program Manager
Chrysler Corp.
800 Chrysler Drive East
Auburn Hills, MI 48326-2757
313/576-0905

United States Advanced Battery Consortium contribution:	$294,811
DOE contribution:	$294,811

This is a follow-on to their first CRADA. This CRADA will focus on supporting the design and development effort of the dynamic thermal enclosure for the battery for an electric vehicle.

US Windpower:

Robert Guertin
U.S. Windpower, Inc.
6952 Preston Ave.
Livermore, CA 94550
510/455-6012

US Windpower contribution:	$470,000
DOE contribution:	$543,235

This will advance the next generation of wind turbine blades. More efficient and durable blades will be required for reducing the cost of electricity generated by wind, and for helping the domestic wind industry reach target goals set by DOE and strengthen its position in the international market. The goal is to cut the cost of wind-produced electricity by up to 40% by the mid-1990s.

Appendix B

NATIONAL RENEWABLE ENERGY LABORATORY
INDUSTRIAL ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
122142	ZCB-3-13032-01	MIDWEST RESEARCH INSTITUTE	KANSAS CITY	MO	30-SEP-93	29-SEP-98	$22,037,423.00	$73,748,679.00	73748679
122189	ZCB-4-13032-02	MIDWEST RESEARCH INSTITUTE	DEARBORN	MI	23-DEC-93	01-DEC-98	$13,600,000.00	$69,049,307.00	69049307
122385	AAR-4-12297-01	NCI INFORMATION SYSTEMS INC	MC LEAN	VA	31-DEC-93	31-JAN-96	$3,214,429.00	$7,968,455.00	
130397	FAV-4-13216-01	DENVER WEST MANAGEMENT INC	GOLDEN	CO	30-JUN-94	30-JUN-99	$6,591,180.00	$6,591,180.00	
130399	FAV-4-13217-01	DENVER WEST MANAGEMENT INC	GOLDEN	CO	30-JUN-94	30-JUN-99	$6,275,040.00	$6,275,040.00	
106795	XAZ-3-12092-01	WESTINGHOUSE ELECTRIC CORPO	ORLANDO	FL	19-MAR-93	14-SEP-95	$5,721,071.00	$5,721,071.00	
100094	ZAM-2-11040-05	ASTROPOWER INCORPORATED	NEWARK	DE	15-JAN-92	14-MAY-95	$4,448,778.98	$5,577,501.00	2390357
123365	ZAI-4-11294-04	TEXAS INSTRUMENTS INCORPORA	ATTLEBORO	MA	24-JAN-94	23-JAN-97	$4,000,000.00	$5,000,000.00	8999401
100252	ZAM-2-11040-01	SIEMENS SOLAR INDUSTRIES	CAMARILLO	CA	13-MAR-92	12-JUN-95	$4,558,493.24	$4,999,915.00	5490884
100290	ZAM-2-11040-02	SOLAREX CORPORATION	NEWTOWN	PA	18-MAR-92	17-JUN-95	$4,470,775.00	$4,996,522.00	4996523
101975	ZAM-2-11040-07	ENERGY CONVERSION DEVICES I	TROY	MI	08-APR-92	07-JUL-95	$4,566,457.00	$4,978,747.00	5844617
122704	ZAI-4-11294-03	GOLDEN PHOTON INCORPORATED	GOLDEN	CO	07-JAN-94	06-JAN-97	$3,228,500.50	$4,825,171.50	4825171
101833	ZAM-2-11040-06	UTILITY POWER GROUP	CHATSWORTH	CA	20-APR-92	19-JUL-95	$4,241,498.91	$4,571,194.00	93290
120649	ZAI-4-11294-02	SOLAR CELLS INC	TOLEDO	OH	16-NOV-93	15-NOV-96	$1,539,384.50	$3,699,388.00	3699388
138802	YAT-5-14149-01	BIOENGINEERING RESOURCES IN	FAYETTEVILLE	AR	22-DEC-94	22-JUN-98	$2,615,000.00	$3,517,913.00	
128642	FAH-1-11038-01	DENVER WEST MANAGEMENT INC	GOLDEN	CO	01-APR-91	31-MAR-96	$922,969.15	$3,371,556.94	
131215	JAU-4-13031-04	NGV DEVELOPMENT COMPANY INC	LONG BEACH	CA	15-JUL-94	14-JUL-95	$1,265,500.00	$3,335,210.94	
121667	ZAI-4-11294-01	SOLAREX CORPORATION	FREDERICK	MD	08-DEC-93	07-DEC-96	$2,118,377.50	$3,177,822.00	3177822
102025	ZAM-2-11040-04	ENTECH INCORPORATED	D F W AIRPORT	TX	17-FEB-92	14-JUN-95	$2,061,727.00	$2,699,831.00	83499
100254	ZAN-1-19019-05	SIEMENS SOLAR INDUSTRIES	CAMARILLO	CA	01-MAY-91	15-APR-95	$1,665,403.02	$2,400,000.00	2208379
100198	ZAN-0-19019-01	GOLDEN PHOTON INCORPORATED	GOLDEN	CO	18-JUN-90	30-JUN-95	$1,034,329.82	$2,326,446.00	1024145
100008	ZAN-1-19019-04	SOLAREX CORPORATION	NEWTOWN	PA	08-NOV-90	30-AUG-95	$1,155,556.00	$2,251,461.00	964913
100190	ZAA-2-11295-02	NORTHERN POWER SYSTEMS INC	MORETOWN	VT	27-MAY-92	01-APR-95	$2,080,472.03	$2,194,701.00	1574567
100200	ZAZ-2-11213-01	POWER GENERATING INCORPORAT	FORT WORTH	TX	15-JUL-92	31-DEC-96	$721,675.13	$1,699,954.00	1699954
102622	ZAM-2-11091-01	ADVANCED PHOTOVOLTAIC SYSTE	LAWRENCEVILLE	NJ	01-DEC-91	30-APR-95	$1,143,959.25	$1,695,311.00	1695311
127545	FAV-2-11279-01	6800 JOYCE STREET COMPANY	TOLEDO	OH	19-FEB-92	18-FEB-97	$684,569.00	$1,488,588.00	
124297	JAU-4-13031-03	KLEENAIR SYSTEMS INCORPORAT	MARTINSBURG	WV	10-FEB-94	08-AUG-95	$625,000.00	$1,378,935.00	
134118	ZAN-4-13318-01	SOLAREX CORPORATION	NEWTOWN	PA	13-SEP-94	12-SEP-97	$400,000.00	$1,260,000.00	1449248
131789	ZAN-4-13318-02	UNITED SOLAR SYSTEMS CORPOR	TROY	MI	29-JUL-94	28-JUL-97	$400,000.00	$1,260,000.00	1389791
128680	ZAA-4-12272-03	SECOND WIND INCORPORATED	SOMERVILLE	MA	19-MAY-94	31-MAR-96	$1,246,878.00	$1,246,878.00	534377
113413	YAU-3-11285-01	E A ENGINEERING SCIENCE & T	SILVER SPRINGS	MD	15-JUN-93	15-JUN-96	$501,949.01	$1,223,001.32	
105657	XAG-3-11219-01	SPIRE CORPORATION	BEDFORD	MA	07-JAN-93	30-MAY-95	$1,213,996.00	$1,213,996.00	303498
124261	ZAA-4-12272-02	ELECTRONIC POWER CONDITIONI	CORVALLIS	OR	14-FEB-94	31-DEC-95	$1,209,939.00	$1,209,939.00	518545
101790	YAI-2-12069-01	INTERNATIONAL SOLAR ELECTRI	INGLEWOOD	CA	25-MAR-92	30-APR-95	$966,346.15	$1,190,101.00	
113444	ZAA-3-11295-05	CARTER WIND TURBINES INCORP	BURKBURNETT	TX	18-JUN-93	18-DEC-95	$1,076,426.00	$1,076,426.00	717617
121860	YAW-4-13020-03	MANTECH ENVIRONMENTAL TECH	RES TRIANGLE PARK	NC	10-DEC-93	31-MAY-95	$1,049,374.00	$1,049,374.00	
105659	ZAG-3-11219-02	SPRINGBORN LABORATORIES INC	ENFIELD	CT	30-DEC-92	01-JUN-96	$588,890.00	$1,046,091.00	448325
138542	AAA-5-13161-03	FLOWIND CORPORATION	SAN RAFAEL	CA	22-DEC-94	22-DEC-96	$1,000,000.00	$1,000,000.00	
130265	AAA-4-13161-02	NEW WORLD GRID POWER COMPAN	N PALM SPRINGS	CA	24-JUN-94	23-JUN-96	$1,000,000.00	$1,000,000.00	
123897	AAA-4-13161-01	ZOND SYSTEMS	TEHACHAPI	CA	01-FEB-94	01-FEB-96	$800,000.00	$1,000,000.00	
131126	AAX-4-14191-01	BREINER CONSTRUCTION COMPAN	DENVER	CO	12-JUL-94	13-MAY-95	$1,019,449.00	$997,798.00	
100162	ZAA-2-11295-03	ATLANTIC ORIENT CORPORATION	NORWICH	VT	26-JUN-92	30-JUN-95	$862,741.96	$983,594.00	508792
134396	JAU-4-13031-05	HAWTHORNE POWER SYSTEMS	SAN DIEGO	CA	15-SEP-94	15-MAR-96	$400,000.00	$983,273.00	
131311	ZAN-4-13318-11	ENERGY CONVERSION DEVICES I	TROY	MI	19-JUL-94	18-JUL-97	$300,000.00	$945,000.00	
130387	JAU-4-13031-01	NATURAL FUELS CORPORATION	DENVER	CO	28-JUN-94	27-JUN-95	$407,500.00	$915,727.00	
124349	AAW-4-13020-02	ENVIRONMENTAL RESEARCH & DE	GAITHERSBURY	MD	10-FEB-94	15-MAY-95	$904,618.90	$904,618.90	
110612	TAO-3-12241-01	RANN INCORPORATED	PALO ALTO	CA	19-APR-93	31-MAR-96	$845,778.00	$845,778.00	
142089	YCC-5-14072-01	RADIAN CORPORATION	DALLAS	TX	16-FEB-95	15-AUG-97	$300,621.09	$842,248.66	
123581	ZAW-4-12244-01	IMPCO TECHNOLOGIES INCORPOR	SEATTLE	WA	31-JAN-94	30-JAN-96	$599,652.00	$768,011.00	768011
128329	ZAA-4-12272-01	CERTEK CORPORATION	BEDFORD	MA	11-MAY-94	10-MAY-96	$765,644.00	$765,644.00	328134
116739	YAA-3-13394-01	PRINCETON ECONOMIC RESEARCH	ROCKVILLE	MD	31-AUG-93	17-JUN-95	$757,240.00	$757,240.00	
133897	YCC-4-14072-02	SYSTEMS APPLICATIONS INTERN	SAN RAFAEL	CA	06-SEP-94	05-OCT-96	$288,364.86	$722,288.72	
134357	AAA-4-12272-04	PS ENTERPRISES INCORPORATED	NORTH PALM SPRINGS	CA	20-SEP-94	19-SEP-96	$698,654.00	$698,654.00	

NATIONAL RENEWABLE ENERGY LABORATORY
INDUSTRIAL ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
106778	AAI-3-11061-02	SOLAREX CORPORATION	NEWTOWN	PA	04-FEB-93	31-MAY-95	$200,000.00	$680,000.00	
134727	AAC-4-14223-01	INFORMATION RESOURCES INCOR	ARLINGTON	VA	04-OCT-94	04-OCT-95	$666,786.22	$666,786.22	
121738	ZAE-3-12314-03	SOLAR KINETICS INC	DALLAS	TX	09-DEC-93	09-NOV-95	$244,545.00	$630,281.00	270120
112561	KAW-3-13298-01	HAZEN RESEARCH INCORPORATED	GOLDEN	CO	28-MAY-93	31-MAY-95	$550,000.00	$628,780.00	
100594	AD-2-11082-01	CRANE CARRIER COMPANY	TULSA	OK	12-MAY-92	31-JUL-95	$84,299.00	$601,399.00	
100316	TAN-2-12232-01	MOUNTAIN VALLEY ENERGY INC	BOULDER	CO	01-AUG-92	31-JUL-95	$597,191.52	$597,191.52	
117787	YAW-3-13384-01	HAZEN RESEARCH INCORPORATED	GOLDEN	CO	01-JAN-94	30-APR-95	$595,955.00	$595,955.00	
131808	ZAA-4-12272-05	R LYNETTE ASSOCIATES INC	REDMOND	WA	29-JUL-94	28-JUL-96	$559,535.00	$559,535.00	
101722	ZAA-2-11120-01	CUMMINS POWER GENERATION IN	COLUMBUS	IN	30-MAR-92	30-APR-95	$518,774.21	$537,001.00	119225
136351	AAD-5-13504-05	BERGEY WINDPOWER COMPANY	NORMAN	OK	31-OCT-94	30-OCT-95	$457,791.00	$457,791.00	
133249	YAC-4-14252-01	XYTEL CORPORATION	MT PROSPECT	IL	22-AUG-94	22-JUN-95	$448,580.00	$448,580.00	
141274	AAB-5-15600-01	MECH EL CONTRACTING INCORPO	AURORA	CO	22-FEB-95	22-JUN-95	$397,990.00	$397,990.00	
140761	KAZ-4-13462-06	IBACOS INCORPORATED	PITTSBURGH	PA	10-FEB-95	10-AUG-95	$370,754.00	$370,754.00	
143074	AAB-5-15613-01	COLORADO PIPING AND MECHANI	DENVER	CO	30-MAR-95	15-JUN-95	$346,250.00	$346,250.00	
141544	TAT-5-15182-01	NEW RESOURCES GROUP	FREEMAN	MO	01-MAR-95	01-DEC-95	$345,239.00	$345,239.00	
111867	AAL-3-13297-01	HEWLETT PACKARD	PALO ALTO	CA	07-MAY-93	07-MAY-95	$345,000.00	$345,000.00	
102613	YD-2-11049-1	ACUREX ENVIROMENTAL CORPORA	MOUNTAIN VIEW	CA	21-JUL-92	21-JUL-95	$344,600.00	$344,600.00	
103481	TAT-2-12305-01	ANTONELLI TERRY STOUT & KRA	WASHINGTON	DC	01-OCT-92	31-OCT-95	$320,000.00	$341,000.00	
141272	AAC-5-14390-01	ADEPT GROUP INCORPORATED	LOS ANGELES	CA	23-FEB-95	23-FEB-96	$332,506.00	$332,506.00	
142550	KAR-5-15121-01	STEVEN WINTER ASSOCIATES IN	NORWALK	CT	03-MAR-95	03-JAN-96	$332,166.00	$332,166.00	
140452	KAZ-4-13462-05	IBACOS INCORPORATED	PITTSBURGH	PA	02-FEB-95	02-FEB-96	$317,679.00	$317,679.00	
140809	ZAF-5-14142-01	UNITED SOLAR SYSTEMS CORPOR	TROY	MI	02-FEB-95	02-AUG-95	$316,081.25	$316,081.25	316081
139625	ZAF-5-14142-04	ENERGY PHOTOVOLTAICS INC	LAWRENCEVILLE	NJ	12-JAN-95	12-APR-95	$250,000.00	$312,500.00	
122192	YAC-4-14043-01	TECHNOLOGY AND MANAGEMENT S	GAITHERSBURG	MD	21-DEC-93	21-JAN-96	$312,468.00	$312,468.00	
135056	ACC-5-14064-01	NATURAL GAS VEHICLE TECHNOL	AUSTIN	TX	10-OCT-94	09-NOV-95	$300,615.00	$300,615.00	
142263	ZAF-5-14142-05	SOLAR CELLS INC	TOLEDO	OH	14-MAR-95	14-AUG-95	$300,000.00	$300,000.00	75000
137062	JAT-5-14449-01	THE FAXON COMPANY	WESTWOOD	MA	09-NOV-94	30-SEP-95	$300,000.00	$300,000.00	
142896	YCF-5-14050-02	THIOKOL CORPORATION	BRINGHAM CITY	UT	28-MAR-95	28-APR-96	$219,785.00	$299,502.00	
140067	TAL-5-15094-01	BRANDEGEE INCORPORATED	PITTSBURGH	PA	27-JAN-95	27-JAN-97	$299,000.00	$299,000.00	
126147	KAW-3-13298-05	HAZEN RESEARCH INCORPORATED	GOLDEN	CO	24-MAR-94	30-JUN-95	$272,858.00	$290,295.00	
101835	ZM-2-11040-6A	UTILITY POWER GROUP	PRINCETON	NJ	17-APR-92	19-JUL-95	$40,579.92	$283,228.00	
140870	YAC-5-15133-01	ROYBAL CORPORATION	DENVER	CO	15-FEB-95	15-FEB-96	$299,827.33	$277,617.90	
136164	AAD-5-13504-06	NEW WORLD VILLAGE POWER COM	WAITSFIELD	VT	26-OCT-94	25-OCT-95	$263,090.00	$263,090.00	
139507	YAP-5-14349-01	ENERGY RESEARCH CORPORATION	DANBURY	CT	16-JAN-95	16-JAN-97	$246,261.00	$246,261.00	
120079	AAW-4-13020-01	AUTOMOTIVE TESTING LABORATO	EAST LIBERTY	OH	05-NOV-93	01-APR-95	$245,407.00	$245,407.00	
111443	AAC-3-13288-01	INFORMATION RESOURCES INCOR	WASHINGTON	DC	03-MAY-93	15-MAY-95	$240,608.40	$240,608.40	
124254	JCC-4-14070-01	COMPRESSED GAS TECHNOLOGIES	BALTIMORE	MD	14-FEB-94	13-FEB-97	$146,970.00	$235,910.00	
126191	AAH-4-14121-01	NEW SOLID LTD	DENVER	CO	29-MAR-94	31-MAR-96	$153,099.77	$230,645.72	
133893	TCF-4-14177-01	HAUSER CHEMICAL RESEARCH IN	BOULDER	CO	02-SEP-94	01-MAR-96	$131,815.00	$230,065.00	
134399	KAW-3-13298-07	HAZEN RESEARCH INCORPORATED	GOLDEN	CO	21-SEP-94	31-JUL-95	$226,152.06	$226,152.06	
102059	TAR-2-12248-02	L B STEVENS ADVERTISING & D	BOULDER	CO	22-JUL-92	21-JUL-95	$218,000.00	$220,000.00	
127459	KAP-4-14083-01	ANTARES GROUP INCORPORATION	LANDOVER	MD	19-APR-94	18-JUN-95	$218,860.00	$218,860.00	
124786	YAC-4-14107-01	HAZEN RESEARCH INCORPORATED	GOLDEN	CO	24-FEB-94	24-FEB-96	$217,742.00	$217,742.00	
118211	XAI-3-11167-02	SPIRE CORPORATION	BEDFORD	MA	28-SEP-93	27-SEP-95	$212,868.00	$212,868.00	
142858	TCC-5-15213-01	GARRICK & ASSOCIATES	MORRISON	CO	27-MAR-95	26-MAR-96	$195,000.00	$210,001.00	
143004	YAN-5-15102-01	ELECTROTEK CONCEPTS INC	MOUNTAIN VIEW	CA	30-MAR-95	30-MAR-96	$208,386.00	$208,386.00	
129135	ZAU-4-13326-04	WEYERHAEUSER COMPANY	TACOMA	WA	31-MAY-94	28-APR-95	$205,000.00	$205,000.00	390489
114103	AAK-3-13313-01	MOHAWK RESEARCH CORPORATION	ROCKVILLE	MD	28-JUN-93	31-DEC-95	$202,300.00	$202,300.00	
140757	ACI-5-14235-01	BELCAN ENGINEERING GROUP, I	CINCINNATI	OH	13-FEB-95	13-JUN-95	$202,000.00	$202,000.00	
137259	ZAF-5-14142-02	ASTROPOWER INCORPORATED	NEWARK	DE	18-NOV-94	02-MAY-95	$200,000.00	$200,000.00	
115279	ZAW-3-12211-01	AURORA TECHNOLOGY	ALBANY	NY	29-JUL-93	01-APR-95	$60,000.00	$200,000.00	423664
133993	ZCC-4-14290-01	THERMO POWER CORPORATION	WALTHAM	MA	09-SEP-94	08-SEP-95	$200,000.00	$200,000.00	694505
135561	AAC-5-13326-11	WOOD INDUSTRIES COMPANY	VISALIA	CA	17-OCT-94	17-JUL-95	$200,000.00	$200,000.00	

NATIONAL RENEWABLE ENERGY LABORATORY
INDUSTRIAL ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
109780	AAL-3-13264-01	DSE/TMP WORLDWIDE	DENVER	CO	01-APR-93	30-MAY-95	$198,500.00	$198,500.00	
100052	TAV-2-12012-01	WESTERN SYSTEMS INSTALLATIO	DENVER	CO	15-DEC-91	28-APR-95	$169,708.66	$195,589.00	
115020	CAE-3-13383-01	PHILIP LUSK	WASHINGTON	DC	22-JUL-93	01-OCT-95	$193,996.50	$193,996.50	
131545	TAT-4-14301-01	BERKELEY SOLAR GROUP	OAKLAND	CA	21-JUL-94	21-JUL-95	$185,998.55	$185,998.55	
135139	AAD-5-13504-01	SIEMENS SOLAR INDUSTRIES	CAMARILLO	CA	04-OCT-94	04-APR-95	$185,261.00	$185,261.00	
101810	TAR-2-12248-01	DESIGN & IMAGE COMMUNICATIO	DENVER	CO	22-JUL-92	21-JUL-95	$183,979.20	$185,000.00	
133052	YAC-4-14323-01	TDA RESEARCH INC	WHEATRIDGE	CO	11-AUG-94	11-JUN-95	$183,142.00	$183,142.00	
101582	TAT-2-12306-01	CHRISMAN BYNUM & JOHNSON	BOULDER	CO	01-OCT-92	31-OCT-95	$180,000.00	$180,000.00	
131207	KAP-4-14090-01	ENERGETICS INCORPORATED	COLUMBIA	MD	15-JUL-94	14-JUL-95	$173,585.00	$173,585.00	
123885	JCC-4-13503-01	PHILLIPS 66 COMPANY	BARTLESVILLE	OK	03-FEB-94	31-AUG-95	$169,851.20	$169,851.20	
142860	KAP-4-14090-02	ENERGETICS INCORPORATED	COLUMBIA	MD	24-MAR-95	24-DEC-95	$168,295.00	$168,295.00	
122507	CAG-4-14074-01	GRAHAM HAGEY	WILLIAMSBURG	VA	05-JAN-94	04-FEB-96	$164,530.00	$164,530.00	
133280	JCF-4-14270-01	HAUSER CHEMICAL RESEARCH IN	BOULDER	CO	17-AUG-94	16-AUG-95	$161,880.00	$161,880.00	
128449	TAT-4-14219-01	FISHBAUGHER & ASSOCIATES	CHESHIRE	OR	17-MAY-94	28-FEB-96	$155,347.00	$155,347.00	
134985	YAP-4-14403-01	STIRLING TECHNOLOGY CO	RICHLAND	WA	29-SEP-94	28-JUL-95	$130,504.00	$154,586.00	
135287	TAC-5-14439-01	AUTOMATION CONTROLS & ENGIN	ENGLEWOOD	CO	11-OCT-94	11-OCT-95	$154,472.50	$154,472.50	
132457	AAN-4-14001-03	ANDERSON MASON DALE PC	DENVER	CO	04-AUG-94	28-APR-95	$153,799.65	$153,799.65	
141411	KAP-4-14083-04	ANTARES GROUP INCORPORATION	LANDOVER	MD	27-FEB-95	16-OCT-95	$152,533.00	$152,533.00	
101933	AAI-2-56177-01	EMPLOYEE ASSISTANCE PROGRAM	DENVER	CO	01-MAR-92	28-FEB-96	$134,877.09	$151,537.44	
130981	YAR-4-14294-01	DYNCORP EENSP INCORPORATED	ALEXANDRIA	VA	07-JUL-94	06-AUG-95	$149,993.00	$149,993.00	
125950	JAC-4-14108-01	HAUSER CHEMICAL RESEARCH IN	BOULDER	CO	18-MAR-94	18-APR-95	$148,000.00	$148,000.00	
139919	ACL-5-14001-04	ANDERSON MASON DALE PC	DENVER	CO	25-JAN-95	25-APR-95	$145,353.00	$145,353.00	
104525	AAR-3-13158-01	PETER HOFFMANN	HYATTSVILLE	MD	10-DEC-92	31-DEC-95	$144,351.00	$144,351.00	
138538	AAH-5-14399-01	MID-CONTINENT LABORATORY IN	AURORA	CO	16-DEC-94	28-FEB-97	$135,128.00	$135,128.00	
106354	TAT-3-13177-01	C E HANCOCK	BOULDER	CO	20-MAY-93	30-SEP-95	$109,440.00	$134,012.00	
127982	AAC-4-13326-07	KENETECH ENERGY SYSTEMS INC	MERIDEN	CT	02-MAY-94	06-JUN-95	$130,700.00	$130,700.00	
137408	KAN-4-13347-01	JAMES D COPELAND ARCHITECTS	BOULDER	CO	23-NOV-94	23-NOV-96	$128,794.73	$128,794.73	
130972	AAR-4-14019-01	INDUSTRIAL SOLAR TECHNOLOGY	DENVER	CO	06-JUL-94	05-JUL-95	$125,186.00	$125,186.00	
142389	AAA-5-13320-08	ULTRAWIND CORPORATION	LAKEWOOD	CO	14-MAR-95	08-JUL-95	$124,550.00	$124,550.00	
141257	AAA-5-13320-06	ZOND SYSTEMS	TEHACHAPI	CA	23-FEB-95	08-JUL-95	$124,548.00	$124,548.00	
112262	TAT-3-13266-01	HOLLAND AND HART	DENVER	CO	19-MAY-93	30-APR-95	$124,500.00	$124,500.00	
141264	AAA-5-13320-07	FLOWIND CORPORATION	SAN RAFAEL	CA	23-FEB-95	08-JUL-95	$124,072.00	$124,072.00	
141465	AAA-5-13320-09	WIND TURBINE COMPANY	MAPLE VALLEY	WA	01-MAR-95	08-JUL-95	$121,120.00	$121,120.00	
138457	YAR-5-15005-01	SCIENCE APPLICATIONS INTERN	MCLEAN	VA	12-DEC-94	12-DEC-95	$121,000.00	$121,000.00	
141267	AAA-5-13320-04	CERTEK CORPORATION	BEDFORD	MA	23-FEB-95	08-JUL-95	$120,009.00	$120,009.00	
127451	EAK-4-14244-01	W HOAGLAND & ASSOCIATES INC	BOULDER	CO	22-APR-94	31-MAY-95	$118,115.00	$118,115.00	
141668	TAP-5-15129-01	DYNCORP EENSP INCORPORATED	WILMINGTON	DE	01-MAR-95	01-MAR-96	$117,470.00	$117,470.00	
135073	BAC-2-11194-11	DYNCORP EENSP INCORPORATED	ALEXANDRIA	VA	05-OCT-94	05-APR-95	$116,995.10	$116,995.10	
141261	AAA-5-13320-10	NEW WORLD POWER TECHNOLOGY	WAITSFIELD	VT	23-FEB-95	08-JUL-95	$116,366.00	$116,366.00	
131703	EAK-4-14359-01	SHERRING ENERGY ASSOCIATES	PRINCETON	NJ	27-JUL-94	31-DEC-95	$115,772.00	$115,772.00	
124247	AAL-4-14051-01	LABAT-ANDERSON INCORPORATED	LAKEWOOD	CO	14-FEB-94	01-SEP-95	$110,933.56	$110,933.56	
142546	KAR-5-15122-01	BUILDING SCIENCE CORPORATIO	CHESTNUT HILL	MA	22-FEB-95	22-AUG-95	$104,943.00	$104,943.00	
131224	AAE-4-14284-01	CAMBER CORPORATION	WASHINGTON	DC	18-JUL-94	17-APR-95	$104,880.06	$104,880.06	
139720	TAK-5-15039-01	EMPLOYEE ASSISTANCE PROGRAM	DENVER	CO	18-JAN-95	18-JAN-96	$30,250.00	$103,750.00	
142341	BAC-2-12150-13	ENERGETICS INCORPORATED	COLUMBIA	MD	15-MAR-95	31-DEC-95	$99,991.39	$99,991.39	
131008	ACC-4-14231-01	SONEX RESEARCH INCORPORATED	ANNAPOLIS	MD	07-JUL-94	06-JUL-95	$99,941.08	$99,941.08	
139509	AAR-5-15104-01	NCI INFORMATION SYSTEMS INC	MC LEAN	VA	20-JAN-95	20-APR-95	$99,875.00	$99,875.00	
128176	AAC-4-13326-02	NORTHERN STATES POWER COMPA	MINNEAPOLIS	MN	05-MAY-94	04-APR-95	$99,758.00	$99,758.00	
141144	TAH-5-15139-01	QUEST DATABASE CONSULTING I	GREENWOOD VILLAGE	CO	17-FEB-95	16-JAN-96	$74,460.00	$99,430.00	
142999	AAA-5-13320-02	KENETECH WINDPOWER INCORPOR	LIVERMORE	CA	30-MAR-95	08-JUL-95	$99,359.00	$99,359.00	
139713	ACL-5-15607-01	SETPOINT SYSTEMS CORPORATIO	DENVER	CO	20-JAN-95	20-JUN-95	$99,231.00	$99,231.00	
142028	ACM-5-15627-01	CASEWORK SYSTEMS INCORPORAT	LAKEWOOD	CO	08-MAR-95	16-JUL-95	$98,760.00	$98,760.00	
141414	ACI-5-15012-01	RA ENERGY LIMITED	AUSTIN	TX	27-FEB-95	27-AUG-95	$98,408.00	$98,408.00	

NATIONAL RENEWABLE ENERGY LABORATORY
INDUSTRIAL ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
125131	JAU-4-13031-02	PHILLIPS 66 PROPANE COMPANY	COMMERCE CITY	CO	04-MAR-94	03-MAR-96	$64,561.46	$96,493.76	
141426	KAW-5-14211-01	MERIDIAN CORPORATION	ALEXANDRIA	VA	27-FEB-95	27-MAY-95	$95,995.00	$95,995.00	
136716	AAE-5-14269-01	J A PHILLIPS AND ASSOCIATES	BOULDER	CO	07-NOV-94	07-JUL-96	$94,182.40	$94,182.40	
133507	TAT-4-14204-01	RENEWABLE ENERGY CONSULTANT	WASHINGTON	DC	21-AUG-94	21-AUG-95	$92,848.36	$92,848.36	
137193	AAP-5-14347-01	ENVIRONMENTAL SOLUTIONS INC	RICHMOND	VA	17-NOV-94	17-NOV-96	$91,574.00	$91,574.00	
120894	AAN-4-13474-01	NEW SOLID LTD	DENVER	CO	22-NOV-93	30-SEP-95	$90,229.50	$90,229.50	
137923	TAL-5-15086-01	MARSHA LUEVANE	LAKEWOOD	CO	01-JAN-95	31-DEC-97	$39,000.00	$90,000.00	
127101	TAT-4-14094-01	C E HANCOCK	BOULDER	CO	15-APR-94	14-JAN-96	$55,000.00	$89,440.00	
126309	TAT-4-14162-01	ARCHITECTURAL ENERGY CORPOR	BOULDER	CO	31-MAR-94	30-MAY-95	$89,000.00	$89,000.00	
135581	AAD-5-13504-03	PHOTOCOMM INCORPORATED	SCOTTSDALE	AZ	13-OCT-94	12-APR-95	$86,758.00	$86,758.00	
136049	AAD-5-13504-02	SOLAREX CORPORATION	FREDERICK	MD	25-OCT-94	25-APR-95	$85,380.00	$85,380.00	
128206	ACC-4-14214-01	SRA TECHNOLOGIES INCORPORAT	FALLS CHURCH	VA	09-MAY-94	08-MAY-95	$85,137.15	$85,137.15	
129446	HAP-4-14304-01	ARTHUR J POWER & ASSOCIATES	BOULDER	CO	07-JUN-94	31-MAY-95	$84,910.00	$84,910.00	
137189	TAH-5-14417-01	RT INSTALLATIONS INCORPORAT	DENVER	CO	15-NOV-94	14-NOV-95	$74,800.00	$84,600.00	
134632	ACC-4-14336-02	PERFORMANCE ENGINEERING COR	FAIRFAX	VA	26-SEP-94	26-SEP-95	$81,035.84	$81,035.84	
133510	AAF-4-14289-01	AIRFOILS INCORPORATED	STATE COLLEGE	PA	31-AUG-94	30-OCT-95	$79,508.00	$79,508.00	
129717	YAC-4-14314-01	WASTREN INCORPORATED	IDAHO FALLS	ID	13-JUN-94	12-JUN-95	$79,462.00	$79,462.00	
120209	EAK-4-13502-01	ORGANIZATIONAL SYSTEMS CONS	PHILADELPHIA	PA	09-NOV-93	31-MAY-95	$78,906.00	$78,906.00	
139279	EAK-5-15053-01	TSS CONSULTANTS INCORPORATE	RANCHO CORDOVA	CA	12-JAN-95	31-OCT-95	$78,287.75	$78,287.75	
136181	AAD-5-13504-04	BERGEY WINDPOWER COMPANY	NORMAN	OK	24-OCT-94	24-APR-95	$77,959.00	$77,959.00	
138374	CAK-5-15082-01	JOEL NEYMARK	GOLDEN	CO	19-DEC-94	19-DEC-95	$76,000.00	$76,000.00	
129117	AAF-4-14224-01	AWS SCIENTIFIC	ALBANY	NY	27-MAY-94	26-MAY-95	$75,438.00	$75,438.00	
120952	ACC-4-14040-01	RICHARD L WYNN	75015 PARIS	FR	22-NOV-93	22-NOV-95	$75,000.00	$75,000.00	
127476	AAW-4-14256-01	BCS INCORPORATED	COLUMBIA	MD	22-APR-94	21-MAY-95	$74,997.58	$74,997.58	
134997	BCC-2-12150-12	ENERGETICS INCORPORATED	COLUMBIA	MD	29-SEP-94	29-MAY-95	$74,980.77	$74,980.77	
140653	ACK-5-15105-01	CAMBER CORPORATION	WASHINGTON	DC	07-FEB-95	07-JUN-95	$72,531.22	$72,531.22	
105159	YAW-3-13046-01	ENVIRONMENTAL BIOTECHNOLOGI	MENLO PARK	CA	01-DEC-92	28-FEB-96	$71,533.00	$71,533.00	
138662	AAE-5-15032-01	INDUSTRIAL SOLAR TECHNOLOGY	GOLDEN	CO	28-DEC-94	28-JUN-96	$70,871.00	$70,871.00	
106550	TAL-3-13195-01	BARBER-NICHOLS INCORPROATED	ARVADA	CO	15-JAN-93	30-JUN-95	$70,100.00	$70,100.00	
138262	TAR-5-15085-01	CARL J BLIEM	LONGMONT	CO	13-DEC-94	13-DEC-95	$68,980.00	$68,980.00	
115976	ECD-3-13398-01	APPLIED DECISION ANALYSIS I	MENLO PARK	CA	13-JUN-93	31-DEC-95	$67,746.00	$67,746.00	
132485	YAR-4-14309-01	ACUREX ENVIROMENTAL CORPORA	MOUNTAIN VIEW	CA	05-AUG-94	04-AUG-95	$65,294.00	$65,294.00	
142697	KAW-3-13157-07	ENERGETICS INCORPORATED	COLUMBIA	MD	23-MAR-95	31-AUG-95	$64,999.10	$64,999.10	
122373	TAP-4-14102-01	CARL J BLIEM	LONGMONT	CO	29-DEC-93	30-APR-95	$64,950.00	$64,950.00	
141270	ACI-5-14432-01	VISION DESIGN PRODUCTIONS	LAKEWOOD	CO	23-FEB-95	23-AUG-95	$64,831.00	$64,831.00	
124505	KAN-4-13347-02	JAMES D COPELAND ARCHITECTS	BOULDER	CO	17-FEB-94	13-APR-95	$64,350.00	$64,350.00	
121637	TAE-4-14062-01	THOMAS C NABER	ENGLEWOOD	CO	07-DEC-93	01-DEC-95	$63,875.00	$63,875.00	
126195	AAC-4-14129-01	AUGUSTYN & COMPANY	ALBANY	CA	28-MAR-94	30-JUN-95	$60,250.00	$60,250.00	
140095	EAK-5-15064-01	OMI G WALDEN INC/DBA WALDEN	SAVANNAH	GA	31-JAN-95	31-JAN-96	$59,974.00	$59,974.00	
121886	KAL-3-13209-03	ENERGETICS INCORPORATED	COLUMBIA	MD	14-DEC-93	30-JUN-95	$55,073.00	$55,073.00	
121889	CAE-4-14049-01	GERALD G LEIGH	ALBUQUERQUE	NM	14-DEC-93	30-JUN-95	$54,900.00	$54,900.00	
129182	JCC-4-14245-01	ANALYSTS MAINTENANCE LABS I	HOFFMAN ESTATES	IL	01-JUN-94	31-AUG-95	$20,000.00	$54,104.50	
139838	AAC-5-15087-01	AFG FEDERAL	WHEAT RIDGE	CO	24-JAN-95	24-JUN-95	$53,320.00	$53,320.00	
130277	AAP-4-14278-01	NATURAL ENERGY RESOURCES UN	EVERGREEN	CO	24-JUN-94	23-JUN-95	$53,297.00	$53,297.00	
133572	ACC-4-14336-01	MERCO INCORPORATED	GOLDEN	CO	01-SEP-94	31-AUG-95	$53,232.00	$53,232.00	
139275	ACM-5-15095-01	NEW SOLID LTD	DENVER	CO	05-JAN-95	31-DEC-95	$51,025.60	$51,025.00	
138381	AAX-5-14407-01	SOLAR DESIGN ASSOC INC	HARVARD	MA	16-DEC-94	16-DEC-95	$50,000.00	$50,000.00	
112530	EAT-3-13309-01	WINSTON & STRAWN	WASHINGTON	DC	18-MAR-93	31-MAY-95	$50,000.00	$50,000.00	
133235	AAE-4-14262-01	SOLAR DESIGN ASSOC INC	HARVARD	MA	15-AUG-94	30-APR-95	$49,988.00	$49,988.00	
100124	HAC-2-11101-02	NORTHERN POWER SYSTEMS INC	MORETOWN	VT	07-FEB-92	06-NOV-95	$49,986.00	$49,986.00	
134729	AAX-4-14133-01	CRAIG MILLER PRODUCTIONS IN	ATLANTA	GA	28-SEP-94	31-MAR-96	$49,955.00	$49,955.00	
128189	AAI-4-14192-01	ENDECON	SAN RAMON	CA	11-MAY-94	10-MAY-95	$49,953.00	$49,953.00	
141300	TAN-5-15100-01	BROWER & COMPANY	ANDOVER	MA	24-FEB-95	24-DEC-95	$49,895.00	$49,895.00	

NATIONAL RENEWABLE ENERGY LABORATORY
INDUSTRIAL ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
128827	AAR-4-14255-01	INDUSTRIAL SOLAR TECHNOLOGY	DENVER	CO	23-MAY-94	22-AUG-96	$49,803.00	$49,803.00	
137183	KAN-4-13348-13	JAMES D COPELAND ARCHITECTS	BOULDER	CO	10-NOV-94	01-JUL-95	$49,752.50	$49,752.50	
142676	EAK-5-15147-01	BROOKMAN-KING COLLABORATIVE	CATONSVILLE	MD	22-MAR-95	22-SEP-95	$49,324.00	$49,324.00	
138439	TCK-5-15073-01	RICHARD H SUTTON	BOULDER	CO	08-DEC-94	30-JUN-95	$49,140.00	$49,140.00	
135065	BAC-2-12150-11	ENERGETICS INCORPORATED	COLUMBIA	MD	07-OCT-94	01-MAY-95	$47,989.55	$47,989.55	
129715	AAR-4-14293-01	INDUSTRIAL SOLAR TECHNOLOGY	DENVER	CO	13-JUN-94	12-APR-95	$47,812.00	$47,812.00	
141409	KAP-4-14083-03	ANTARES GROUP INCORPORATION	LANDOVER	MD	27-FEB-95	30-APR-95	$46,986.00	$46,986.00	
134921	ACC-4-14336-05	AUTOMOTIVE TESTING LABORATO	EAST LIBERTY	OH	28-SEP-94	28-SEP-95	$46,276.56	$46,276.56	
141187	KAP-5-15004-02	JOHN L ROGERS	NOGALES	AZ	21-FEB-95	30-JUN-95	$46,228.00	$46,228.00	
128682	AAW-4-14218-01	ANTARES GROUP INCORPORATION	LANDOVER	MD	20-MAY-94	19-JUN-95	$46,187.68	$46,187.68	
136324	AAL-5-14423-01	ADVANCED PHOTOVOLTAIC SYSTE	LAWRENCEVILLE	NJ	27-OCT-94	27-MAY-95	$45,948.56	$45,948.56	
131165	AAP-4-14322-01	CHAPMAN RESEARCH GROUP INC	LITTLETON	CO	08-JUL-94	11-SEP-95	$34,270.42	$45,652.42	
134111	CAK-4-14375-01	ANN L MEIGGS	DENVER	CO	14-SEP-94	13-SEP-95	$45,478.50	$45,478.50	
141663	ACK-5-15128-01	RENEWABLE ENERGY CONSULTANT	WASHINGTON	DC	02-MAR-95	02-JUL-95	$45,137.09	$45,137.09	
140091	TAX-5-14420-01	GENE A QUANDT	POCATELLO	ID	31-JAN-95	30-NOV-95	$44,501.00	$44,501.00	
126386	CAK-4-14174-01	RICHARD S WAGNER	BERNARDSVILLE	NJ	01-APR-94	31-JAN-96	$44,311.44	$44,311.44	
126187	AAH-4-14120-01	NEW SOLID LTD	DENVER	CO	01-APR-94	31-MAR-96	$29,311.92	$43,967.88	
102221	CAT-2-12230-01	RAFAEL PICOREL	ZARAGOZA	SP	01-JUL-92	30-SEP-95	$33,688.50	$41,675.00	
129131	TAT-4-14241-01	NEW RESOURCES GROUP	FREEMAN	MO	31-MAY-94	30-SEP-95	$41,452.00	$41,452.00	
137002	KAP-5-15004-01	JOHN L ROGERS	NOGALES	AZ	10-NOV-94	09-NOV-95	$41,043.00	$41,043.00	
142991	TAK-5-14422-01	ADRIENNE HYNES ASSOCIATES I	DENVER	CO	30-MAR-95	30-MAR-96	$40,000.00	$40,000.00	
126797	YCC-4-14238-01	ACUREX ENVIROMENTAL CORPORA	MOUNTAIN VIEW	CA	11-APR-94	30-APR-95	$39,823.46	$39,823.46	
139109	AAT-5-14451-01	INNOVATIVE DESIGN INCORPORA	RALEIGH	NC	03-JAN-95	03-JUL-95	$39,600.00	$39,600.00	
133889	CAK-4-14384-01	JEROME WEINGART	ARLINGTON	VA	02-SEP-94	30-SEP-95	$39,500.00	$39,500.00	
134923	ACC-4-14336-06	AUTOMOTIVE TESTING LABORATO	EAST LIBERTY	OH	29-SEP-94	29-SEP-95	$38,783.00	$38,783.00	
139912	TAH-5-15065-01	ASPEN TECHNOLOGY INCORPORAT	CAMBRIDGE	MA	25-JAN-95	25-APR-95	$36,000.00	$36,000.00	
119682	CAK-4-13470-01	WILLIAM W WARNOCK	BOULDER	CO	28-OCT-93	31-AUG-95	$35,965.00	$35,965.00	
141276	AAB-5-15618-01	INTERSTATE ELECTRICAL CONTR	WHEATRIDGE	CO	22-FEB-95	22-APR-95	$35,213.96	$35,213.96	
142688	KAN-4-13347-16	JAMES D COPELAND ARCHITECTS	BOULDER	CO	23-MAR-95	28-APR-95	$35,177.04	$35,177.04	
115106	AAH-3-13282-01	MICROTECH-TEL INCORPORATED	DENVER	CO	26-JUL-93	31-JUL-95	$33,600.00	$33,600.00	
129069	TAK-4-14226-01	SHERIDAN ROSS & MCINTOSH	DENVER	CO	25-MAY-94	30-JUN-95	$32,000.00	$32,000.00	
131770	CAK-4-14298-01	GEORGE STERZINGER	WASHINGTON	DC	28-JUL-94	27-APR-95	$30,354.00	$30,354.00	
123878	EAK-4-14105-01	REBECCA VORIES/DBA INFINITE	DENVER	CO	01-FEB-94	30-APR-95	$30,240.00	$30,240.00	
135572	AAL-5-15014-01	A WISE MOVE INCORPORATED	COMMERCE CITY	CO	14-OCT-94	13-OCT-95	$30,000.00	$30,000.00	
103412	AAI-3-11061-04	ENERGY PHOTOVOLTAICS INC	LAWRENCEVILLE	NJ	01-NOV-92	28-AUG-95	$30,000.00	$30,000.00	
134914	AAX-4-14410-01	NEOS CORPORATION	LAFAYETTE	CA	28-SEP-94	28-NOV-95	$30,000.00	$30,000.00	
142664	ACD-5-15164-01	SCIENCE APPLICATIONS INTERN	GERMANTOWN	MD	20-MAR-95	20-SEP-95	$29,990.00	$29,990.00	
142673	KAW-3-13157-06	ENERGETICS INCORPORATED	COLUMBIA	MD	23-MAR-95	30-JUN-95	$29,986.82	$29,986.82	
117693	CAE-3-13410-01	STEVEN W CEARLEY	DENVER	CO	21-SEP-93	20-SEP-95	$29,340.00	$29,340.00	
131221	CAE-4-14286-01	MICHAEL L MORRISON	TUCSON	AZ	18-JUL-94	18-JUL-95	$29,196.75	$29,196.75	
138737	EAK-5-15098-01	ENTECH INTERNATIONAL INC	BARRINGTON	IL	30-DEC-94	29-DEC-95	$28,300.00	$28,300.00	
111249	CAK-3-13290-01	YVONNE SHINTON	NORTHGLENN	CO	23-MAR-93	30-SEP-95	$26,470.00	$26,470.00	
141184	CAK-5-15124-01	JOSEPH SHABTAI	SALT LAKE CITY	UT	17-FEB-95	17-FEB-96	$25,641.00	$25,641.00	
105523	BAV-3-12318-01	GENERAL INFORMATION SERVICE	BLYTHEWOOD	SC	08-DEC-92	10-JAN-96	$25,526.40	$25,526.40	
141285	CAK-5-15154-01	JAMES GRAHAM	GROSSE PTE PK	MI	24-FEB-95	24-FEB-96	$25,092.00	$25,092.00	
132729	AAE-4-14369-01	RENEWABLE ENERGY CONSULTANT	WASHINGTON	DC	10-AUG-94	09-APR-95	$25,000.80	$25,000.80	
142937	EAK-5-15171-01	HANSEN, MCQUAT, HARMIN & RH	SAN FRANCISCO	CA	27-MAR-95	31-DEC-95	$25,000.00	$25,000.00	
140798	BPO 140771. P	JOINING SERVICES INC	BROOMFIELD	CO	14-FEB-95	31-JAN-96	$25,000.00	$25,000.00	1
139916	ACF-5-14418-01	MARC-IV	BUCYRUS	KS	25-JAN-95	25-APR-95	$25,000.00	$25,000.00	
132732	TAP-4-14368-01	MOUNTAIN ENERGY PARTNERSHIP	NEDERLAND	CO	10-AUG-94	09-FEB-97	$25,000.00	$25,000.00	
131092	CCD-14303-01	J DILLARD MURRELL	SALINE	MI	13-JUL-94	13-JUL-95	$24,985.00	$24,985.00	
140927	EAK-5-15119-01	BARRETT CONSULTING GROUP	COLORADO SPRINGS	CO	12-FEB-95	12-FEB-96	$24,899.00	$24,899.00	
130979	ACF-4-14266-01	DIRECTED TECHNOLOGIES INCOR	ARLINGTON	VA	07-JUL-94	06-JUL-95	$24,770.00	$24,770.00	

NATIONAL RENEWABLE ENERGY LABORATORY
INDUSTRIAL ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
139716	ACM-5-15603-01	SETPOINT SYSTEMS CORPORATIO	DENVER	CO	19-JAN-95	19-JUN-95	$24,400.00	$24,400.00	
142863	CAK-5-15160-01	LEE LYND	MERIDEN	NH	27-MAR-95	26-MAR-96	$24,105.00	$24,105.00	
130405	CAK-4-14247-01	J WARD PHILLIPS	FRIDAY HARBOR	WA	30-JUN-94	31-JUL-95	$23,412.00	$23,412.00	
126149	CAK-4-14135-01	LAWRENCE MAYER	PHOENIX	AZ	25-MAR-94	31-DEC-95	$23,026.00	$23,026.00	
141958	KAN-4-13347-18	JAMES D COPELAND ARCHITECTS	BOULDER	CO	02-MAR-95	18-MAY-95	$22,972.62	$22,972.62	
133514	KAL-3-13207-06	PATRICIA WEIS TAYLOR	EVERGREEN	CO	31-AUG-94	01-MAY-95	$21,830.00	$21,830.00	
141780	AAT-5-15002-01	INSTITUTE OF POLICY AND MAN	BEIJING		02-MAR-95	02-MAR-96	$21,808.00	$21,808.00	
139241	TCM-5-15080-01	CENTER-OCCUPATIONAL MEDICIN	BOULDER	CO	06-JAN-95	31-DEC-95	$6,750.00	$20,250.00	
131163	EAK-4-14288-01	BOB LAWRENCE & ASSOCIATES	ALEXANDRIA	VA	11-JUL-94	10-MAY-95	$20,216.00	$20,216.00	
140854	KAW-3-13458-06	DECISION ANALYSIS CORPORATI	VIENNA	VA	10-FEB-95	10-OCT-95	$20,173.12	$20,173.12	
134718	TAH-4-14209-02	ENSAR GROUP INCORPORATED	BOULDER	CO	27-SEP-94	26-OCT-95	$20,000.00	$20,000.00	
135069	ACD-4-14311-01	OCEAN COUNTY RECYCLING CENT	LONG RIVER	NJ	06-OCT-94	06-JUL-95	$20,000.00	$20,000.00	68000
134613	CCD-4-14389-01	JANA B MILFORD	BOULDER	CO	26-SEP-94	25-SEP-95	$19,795.00	$19,795.00	
141180	CCD-5-15172-01	MICHAEL MILLIGAN	WESTMINSTER	CO	17-FEB-95	17-JUL-95	$19,294.00	$19,294.00	
134387	ECD-4-14395-01	ROBERT BEIN-WILLIAM FROST &	IRVINE	CA	16-SEP-94	15-SEP-95	$3,091.00	$18,546.00	
129403	CAK-4-14232-01	SHIRLEY BALL	NASHUA	MT	06-JUN-94	25-OCT-95	$18,457.00	$18,457.00	
139113	CCK-5-15118-01	THOMAS HOLT	LITTLETON	CO	03-JAN-95	03-JUN-95	$18,128.00	$18,128.00	
134391	ECD-4-14396-01	ANDERSON DEBARTOLO PAN INC	PHOENIX	AZ	15-SEP-94	14-SEP-95	$3,007.50	$18,045.00	
137264	AAE-5-14456-01	KISS & COMPANY	NEW YORK	NY	21-NOV-94	30-JUN-95	$16,397.00	$16,397.00	
133938	AAF-4-14248-01	MR LIGHTNING	MONUMENT	CO	12-SEP-94	11-JUN-95	$16,324.00	$16,324.00	
135084	CAK-4-14416-01	JASON MARK	BERKELEY	CA	07-OCT-94	06-JUL-95	$16,206.00	$16,206.00	
140662	JAK-5-15097-01	BENEFIT PLAN ADMIN	BOULDER	CO	08-FEB-95	08-FEB-96	$15,250.00	$15,250.00	
138684	CCK-5-15067-01	JULIO BRAGAGNOLO	NEWARK	DE	29-DEC-94	29-JUN-95	$15,000.00	$15,000.00	
141755	PO 135007. LA	SAN JUAN SNOW REMOVAL	GOLDEN	CO	14-OCT-94	30-SEP-95	$9,900.00	$14,900.00	1
133891	CCD-4-14394-01	BENJAMIN EVANS	BLACKSBURG	VA	09-SEP-94	08-SEP-95	$2,483.00	$14,898.00	
131708	EAK-4-14327-01	BOULDER ENERGY ASSOCIATES	BOULDER	CO	27-JUL-94	26-JUL-95	$14,798.00	$14,798.00	
136534	CAK-5-14433-01	FRANK GRIFFITH	SANIBEL ISLAND	FL	01-NOV-94	31-OCT-95	$14,744.00	$14,744.00	
136073	CAK-5-14436-01	JOHN DALTON	FORT MYERS BEACH	FL	24-OCT-94	24-OCT-95	$14,744.00	$14,744.00	
139718	AAX-5-15070-01	SERVICE ENGINEERING LABORAT	GREENFIELD	MA	18-JAN-95	18-JUN-95	$14,600.00	$14,600.00	
134494	ECD-4-14397-01	HARRISON FRAKER ARCHITECT I	MINNEAPOLIS	MN	22-SEP-94	21-SEP-95	$2,416.50	$14,499.00	
136069	CAK-5-14434-01	STEPHEN NAGY	SAN RAFAEL	CA	24-OCT-94	24-OCT-95	$14,244.00	$14,244.00	
136075	CAK-5-14435-01	HENRY RODEEN	LA JOLLA	CA	24-OCT-94	24-OCT-95	$14,243.50	$14,243.50	
136166	EAK-4-14401-01	ENTECH INTERNATIONAL INC	BARRINGTON	IL	27-OCT-94	31-DEC-95	$14,120.00	$14,120.00	
104765	CAT-3-13035-01	ARTHUR K INGBERMAN	VIENNA	VA	24-NOV-92	30-NOV-95	$13,883.00	$13,883.00	
138462	EAK-5-15046-01	BLUEPOINT ASSOCIATES LIMITE	SAN LUIS OBISPO	CA	19-DEC-94	19-DEC-95	$13,693.00	$13,693.00	
143215	AAB-5-15631-01	BUEHLER MOVING & STORAGE CO	DENVER	CO	31-MAR-95	30-JUN-95	$12,240.00	$12,240.00	
139846	CAE-5-15000-01	PAT DUGAN	NORTH FORT MYERS	FL	24-JAN-95	24-JAN-96	$11,432.00	$11,432.00	
124354	AAT-4-14048-01	AVEDA CORPORATION	BLAINE	MN	11-FEB-94	10-DEC-96	$11,000.00	$11,000.00	
140290	REFUSE COLLECT	WASTE MANAGEMENT DENVER NOR	DENVER	CO	01-JAN-95	30-JUN-95	$10,500.00	$10,500.00	1
137000	ECK-5-15056-01	DESKTOP SYSTEMS CORPORATION	ARVADA	CO	15-NOV-94	30-APR-95	$10,200.00	$10,200.00	
133292	CAK-4-14333-01	RICHARD L HINMAN	OLD LYME	CT	24-AUG-94	23-AUG-95	$9,932.00	$9,932.00	
130234	CAK-4-14267-01	J WOODS HALLEY	MINNEAPOLIS	MN	23-JUN-94	31-MAY-95	$9,807.00	$9,807.00	
135080	CAT-5-15011-01	JAN T BIALASIEWICZ	LITTLETON	CO	03-OCT-94	03-MAY-95	$9,800.00	$9,800.00	
133988	ACC-4-14336-04	AUTOMOTIVE TESTING LABORATO	EAST LIBERTY	OH	08-SEP-94	07-SEP-95	$9,723.00	$9,723.00	
138673	CCK-5-15044-01	RUSSELL CORMIER	DENVER	CO	22-DEC-94	30-APR-95	$9,720.00	$9,720.00	
120465	CAK-4-14034-01	PAUL SCHISSEL	GOLDEN	CO	08-NOV-93	07-NOV-95	$9,600.00	$9,600.00	
131326	CCD-4-14302-01	RAYMOND J BAHM	ALBUQUERQUE	NM	19-JUL-94	30-JUN-95	$9,268.00	$9,268.00	
141012	ECD-5-15173-01	FUTURE RESOURCES ASSOC	BERKELEY	CA	16-FEB-95	16-APR-95	$9,210.00	$9,210.00	
137060	CAK-5-15009-01	L K ANDERSON	COLORADO SPRINGS	CO	14-NOV-94	14-NOV-95	$9,100.00	$9,100.00	
142981	AAX-5-15169-01	ADEL IBRAHIM ZAKY KINAWY	IMBABA	CA	29-MAR-95	15-MAY-95	$8,910.00	$8,910.00	
141961	TCM-5-15614-01	FIRE MARK LIMITED	BOULDER	CO	07-MAR-95	05-JUN-95	$8,400.00	$8,400.00	
139844	CAK-5-15090-01	LYNN A MOORE	DENVER	CO	25-JAN-95	30-NOV-95	$7,700.00	$7,700.00	
125724	EAT-4-14052-01	PATPRO	ARLINGTON	VA	16-MAR-94	30-APR-95	$7,500.00	$7,500.00	

NATIONAL RENEWABLE ENERGY LABORATORY
INDUSTRIAL ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
126322	EAK-4-14155-01	ROBERT M KELLY	CARY	NC	31-MAR-94	31-DEC-95	$7,368.00	$7,368.00	
138719	CCK-5-15123-01	SHABBAR SAIFEE	CHRISTIANSTED	ST	29-DEC-94	29-APR-95	$6,905.00	$6,905.00	
121742	KAL-3-13207-03	PATRICIA WEIS TAYLOR	EVERGREEN	CO	09-DEC-93	01-APR-95	$6,410.00	$6,410.00	
134634	KAL-3-13206-06	MAUREEN MCINTYRE	BOULDER	CO	26-SEP-94	30-SEP-95	$6,000.00	$6,000.00	
131324	EAK-4-14281-01	BUILDING SCIENCE ENGINEERIN	HARVARD	MA	19-JUL-94	30-APR-95	$5,834.00	$5,834.00	
139727	ACK-5-15111-01	PAUL AHRENS	HOUSTON	TX	18-JAN-95	18-APR-95	$5,760.00	$5,760.00	
141611	ECD-5-15181-01	FISHBAUGHER & ASSOCIATES	CHESHIRE	OR	01-MAR-95	01-AUG-95	$5,544.00	$5,544.00	
142685	ACM-5-15622-01	MCDS INCORPORATED	DENVER	CO	22-MAR-95	10-APR-95	$5,534.00	$5,534.00	
134585	EAK-4-14377-01	PV ENERGY SYSTEMS INC	CATLETT	VA	26-SEP-94	25-JUN-95	$5,358.00	$5,358.00	
140141	INSTALL FLOW V	A C RICH AND SON	CARMICHAEL	CA	01-FEB-95	31-JUL-96	$5,000.00	$5,000.00	1
141724	BPO 141716. AN	HUFFMAN LABORATORIES INC	GOLDEN	CO	06-MAR-95	31-DEC-95	$5,000.00	$5,000.00	1
140631	BPO 140448, ST	JORGENSEN STEEL AND ALUMINU	DENVER	CO	10-FEB-95	31-JAN-96	$5,000.00	$5,000.00	1
140830	BPO 138115. S	NEVES UNIFORMS INCORPORATED	DENVER	CO	15-FEB-95	28-FEB-96	$5,000.00	$5,000.00	1
140438	INSTALL FLOW M	WILLIAM R MURRAY AND SON	SACREMONTO	CA	13-FEB-95	31-JUL-96	$5,000.00	$5,000.00	1
126198	EAK-4-14164-01	DAVID V HUDSON JR	HOUSTON	TX	28-MAR-94	30-SEP-95	$4,997.00	$4,997.00	
118870	CAE-3-13529-01	EITAN EHRENFREUND	HAIFA	IS	25-JUL-94	24-JUL-95	$4,800.00	$4,800.00	
132480	TAX-4-14315-01	GOODSON & ASSOCIATES INCORP	LAKEWOOD	CO	03-AUG-94	02-JUN-95	$4,605.00	$4,605.00	
142021	ACM-5-15628-01	L NOTHHAFT & SON INCORPORAT	DENVER	CO	08-MAR-95	07-APR-95	$4,530.16	$4,530.16	
142396	P.O. 141390. V	DENVER VALVE & FITTING CO	LAKEWOOD	CO	10-MAR-95	09-MAR-96	$4,500.00	$4,500.00	1
142949	141956. thermo	JMC INSTRUMENTS INCORPORATE	LITTLETON	CO	29-MAR-95	31-MAR-96	$4,500.00	$4,500.00	1
142987	141942. variou	R J GALLAGHER	DENVER	CO	30-MAR-95	31-MAR-96	$4,500.00	$4,500.00	1
142948	141839. variou	RYALL ELECTRIC SUPPLY CO	DENVER	CO	29-MAR-95	31-MAR-96	$4,500.00	$4,500.00	1
140794	CAK-5-15132-01	ARTHUR P FRAAS	KNOXVILLE	TN	09-FEB-95	09-MAY-95	$4,467.00	$4,467.00	
134942	KAL-3-13207-07	PATRICIA WEIS TAYLOR	EVERGREEN	CO	29-SEP-94	30-SEP-95	$4,388.00	$4,388.00	
135276	AAK-5-14437-01	LIDKE & ASSOCIATES INCORPOR	ENGLEWOOD	CO	11-OCT-94	31-DEC-95	$3,900.00	$3,900.00	
140706	PO 140586, NWT	BOB JONES SERVICES	WESTMINSTER	CO	01-FEB-95	31-DEC-95	$3,000.00	$3,000.00	1
140169	MEDICAL SUPPLI	NORMED INC	SEATTLE	WA	01-OCT-94	30-SEP-95	$1,000.00	$3,000.00	1
142695	AAK-5-15218-01	LARRY C ALLEN	ARVADA	CO	24-MAR-95	24-JUL-95	$2,500.00	$2,500.00	
139729	CCK-5-15038-01	HOWARD ENTIN	DENVER	CO	18-JAN-95	30-SEP-95	$2,100.00	$2,100.00	
140585	BPO 140136, fa	BACON FABRICATION	DENVER	CO	09-FEB-95	31-JAN-96	$2,000.00	$2,000.00	1
120755	ACD-4-14027-01	CAROLINA COUNTRY BUILDERS O	PITTSBORO	NC	17-NOV-93	30-DEC-96	$2,000.00	$2,000.00	
121151	ACD-4-14031-01	EID-CO BUILDINGS INCORPORAT	FARGO	ND	29-NOV-93	30-DEC-96	$2,000.00	$2,000.00	
124479	ACD-4-14028-01	ONE DESIGN INCORPORATED	WINCHESTER	VA	16-FEB-94	15-FEB-96	$2,000.00	$2,000.00	
121750	ACD-4-14029-01	WATROUS ASSOCIATES ARCHITEC	LOUISVILLE	KY	10-DEC-93	30-DEC-96	$2,000.00	$2,000.00	
141613	EAK-5-15149-01	SOUTHERN CALIFORNIA EDISON	ROSEMEAD	CA	01-MAR-95	01-SEP-95	$1,302.00	$1,302.00	
140656	CCD-5-15180-01	SUSAN L KLEIN	DENVER	CO	08-FEB-95	08-APR-95	$1,280.00	$1,280.00	
142947	141856. grindi	B G CUTTER WORKS	ENGLEWOOD	CO	29-MAR-95	31-MAR-96	$1,000.00	$1,000.00	1
141266	PO 141260, MAI	MAILING NOW	DENVER	CO	24-FEB-95	30-SEP-95	$1,000.00	$1,000.00	1
140759	AAK-5-15193-01	ROBERT EBISCH	WHEATRIDGE	CO	10-FEB-95	10-APR-95	$1,000.00	$1,000.00	
140687	PO 135016, DEL	ALL STAR DELIVERY INCORPORA	DENVER	CO	07-NOV-94	31-OCT-95	$575.00	$575.00	1
142950	141582. locksm	DOUBLE AA LOCK & SAFE INCOR	LAKEWOOD	CO	01-NOV-94	31-OCT-95	$500.00	$500.00	1
141709	PO 141389. FI	SECURITY SPECIALIST LIMITED	DENVER	CO	06-MAR-95	28-FEB-96	$345.00	$345.00	1

NATIONAL RENEWABLE ENERGY LABORATORY
EDUC/UNIV ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
106792	XAV-3-13170-01	UNIVERSITY OF DELAWARE	NEWARK	DE	27-JAN-93	27-JAN-97	$2,957,311.00	$5,079,878.00	
135826	FAL-5-14175-01	JEFFERSON COUNTY SCHOOL DIS	GOLDEN	CO	01-NOV-94	31-OCT-97	$1,657,132.00	$1,657,132.00	
100471	XAL-1-11126-01	UNIVERSITY OF MASSACHUSETTS	AMHERST	MA	03-JUL-91	31-OCT-95	$962,550.94	$1,286,690.00	
129124	XAN-4-13318-08	IOWA STATE UNIVERSITY	AMES	IA	31-MAY-94	30-MAY-97	$313,981.00	$994,108.00	
131132	XAN-4-13318-03	PENNSYLVANIA STATE UNIVERSI	UNIVERSITY PARK	PA	13-JUL-94	12-JUL-97	$249,275.00	$784,987.00	
137931	XCF-5-14326-01	UNIVERSITY OF HAWAII	HONOLULU	HI	05-DEC-94	04-MAY-96	$772,904.00	$772,904.00	
100002	XAD-0-10087-01	UNIVERSITY OF MIAMI	CORAL GABLES	FL	01-AUG-90	31-MAY-95	$230,063.00	$767,396.00	
100192	XAF-1-11009-03	OHIO STATE UNIVERSITY RESEA	COLUMBUS	OH	17-SEP-91	16-SEP-95	$526,669.09	$733,642.00	
111978	XAD-3-12114-03	UNIVERSITY OF SOUTH FLORIDA	TAMPA	FL	12-MAY-93	12-MAY-96	$402,786.00	$606,373.00	
115665	XAD-3-12114-05	NORTH CAROLINA STATE UNIVER	RALEIGH	NC	05-AUG-93	04-AUG-97	$99,262.00	$597,888.00	
110287	XAD-3-12114-02	UNIVERSITY OF UTAH	SALT LAKE CITY	UT	12-APR-93	11-JUN-96	$402,662.00	$585,961.00	
100481	XAG-2-11036-01	UNIVERSITY OF SOUTH FLORIDA	TAMPA	FL	01-MAR-92	30-APR-95	$547,073.00	$547,073.00	
100432	XAR-2-11248-01	UNIVERSITY OF DELAWARE	NEWARK	DE	15-OCT-91	30-JUN-95	$451,300.39	$524,182.00	
131344	XAL-4-13357-02	UNIVERSITY OF CALIFORNIA LO	LOS ANGELES	CA	19-JUL-94	19-JUL-97	$166,000.00	$498,000.00	
100460	XAG-2-11036-04	COLORADO SCHOOL OF MINES	GOLDEN	CO	20-MAR-92	19-MAY-95	$435,348.08	$485,424.00	36548
100194	XAF-1-11009-01	OREGON STATE UNIVERSITY	CORVALLIS	OR	30-JUL-91	30-SEP-95	$402,966.83	$468,682.00	
113907	XAD-3-12114-01	UNIVERSITY OF ILLINOIS	CHAMPAIGN	IL	28-JUN-93	27-JUN-96	$293,403.00	$459,956.00	
128421	XAN-4-13318-05	PRESIDENT AND FELLOWS OF HA	CAMBRIDGE	MA	17-MAY-94	16-MAY-97	$146,810.00	$458,232.00	
117954	XAP-3-11153-01	UNIVERSITY OF NORTH CAROLIN	CHAPEL HILL	NC	23-SEP-93	22-SEP-95	$453,482.00	$453,482.00	
114706	XAD-3-12114-04	JOHNS HOPKINS UNIVERSITY	BALTIMORE	MD	16-JUL-93	16-JUL-96	$297,996.00	$452,723.00	
100479	XAD-2-11004-05	UNIVERSITY OF SOUTH FLORIDA	TAMPA	FL	12-MAY-92	29-MAR-96	$451,911.00	$451,911.00	
108093	XAD-2-11004-03	REGENTS-UNIV OF CALIFORNIA	BERKELEY	CA	31-JUL-92	31-JUL-95	$443,148.00	$443,148.00	
101825	XAD-2-11004-01	DUKE UNIVERSITY	DURHAM	NC	30-MAR-92	30-JUN-95	$417,473.57	$441,476.00	
100004	XAW-0-10125-01	UNIVERSITY OF NORTH CAROLIN	CHAPEL HILL	NC	30-SEP-90	31-JUL-95	$237,780.56	$411,395.00	
100122	XAG-2-11036-03	GEORGIA TECH RESEARCH CORPO	ATLANTA	GA	01-FEB-92	30-SEP-95	$388,685.30	$410,250.00	
100477	XAG-1-11190-01	UNIVERSITY OF NOTRE DAME	NOTRE DAME	IN	01-OCT-91	31-AUG-95	$314,695.74	$410,000.00	
102182	XAD-2-11004-02	GEORGIA TECH RESEARCH CORPO	ATLANTA	GA	10-APR-92	30-JUN-95	$389,133.04	$398,588.00	
127099	XAN-4-13318-07	UNIVERSITY OF OREGON	EUGENE	OR	18-APR-94	17-APR-97	$183,000.00	$378,000.00	
123305	ZAX-4-14013-01	UNIVERSITY OF TOLEDO	TOLEDO	OH	21-JAN-94	20-JAN-97	$242,848.00	$374,848.00	360150
138540	XAF-5-14076-02	UNIVERSITY OF UTAH	SALT LAKE CITY	UT	19-DEC-94	19-MAR-98	$87,451.00	$371,311.00	
111256	XAU-3-12228-02	UNIVERSITY OF DAYTON	DAYTON	OH	30-APR-93	29-APR-95	$256,960.00	$362,792.00	
100184	XAD-2-11004-06	NORTH CAROLINA STATE UNIVER	RALEIGH	NC	06-MAY-92	30-JUN-95	$338,058.22	$340,494.00	
101845	XAG-2-11036-06	WASHINGTON STATE UNIVERSITY	PULLMAN	WA	15-FEB-92	31-OCT-95	$273,318.52	$327,755.00	
102105	XAD-2-11004-04	MASSACHUSETTS INST OF TECHN	CAMBRIDGE	MA	23-JUL-92	31-JUL-95	$492,950.00	$325,860.00	
128326	XAN-4-13318-06	SYRACUSE UNIVERSITY	SYRACUSE	NY	11-MAY-94	10-MAY-97	$100,000.00	$315,000.00	
131172	XAN-4-13318-09	UNIVERSITY OF NORTH CAROLIN	CHAPEL HILL	NC	07-JUL-94	06-MAY-97	$100,000.00	$315,000.00	
103451	XAR-2-11186-01	OREGON STATE UNIVERSITY	CORVALLIS	OR	20-OCT-92	30-AUG-95	$306,585.00	$306,585.00	
121650	XAX-4-14000-01	COLORADO STATE UNIVERSITY	FORT COLLINS	CO	06-DEC-93	05-DEC-96	$191,995.00	$301,995.00	
136170	XAF-5-14076-04	MONTANA STATE UNIVERSITY	BOZEMAN	MT	26-OCT-94	26-OCT-97	$60,000.00	$299,804.00	
117441	XAH-3-13203-02	UNIVERSITY OF TEXAS AT EL P	EL PASO	TX	14-SEP-93	13-SEP-96	$199,734.00	$299,589.00	
117439	XAH-3-13203-01	TENNESSEE STATE UNIVERSITY	NASHVILLE	TN	14-SEP-93	13-SEP-96	$198,438.00	$298,411.00	
100380	XAG-2-11036-05	UNIVERSITY OF CENTRAL FLORI	ORLANDO	FL	15-APR-92	14-APR-95	$269,950.00	$269,950.00	
109921	XAC-3-13260-01	CORNELL UNIVERSITY	ITHACA	NY	01-APR-93	30-MAY-95	$269,598.00	$269,598.00	
131543	XAL-4-13357-01	CALIFORNIA INSTITUTE OF TEC	PASEDENA	CA	21-JUL-94	20-JUL-97	$105,740.00	$265,585.00	
120559	XAU-4-11193-02	BOARD OF REGENTS/UNIV OF WI	MADISON	WI	12-NOV-93	11-NOV-95	$170,439.00	$260,748.00	
100212	XAG-2-11036-02	PURDUE RESEARCH FOUNDATION	WEST LAFAYETTE	IN	01-MAR-92	31-OCT-95	$215,023.82	$258,662.00	
141157	XCF-5-14328-01	OHIO STATE UNIVERSITY RESEA	COLUMBUS	OH	21-FEB-95	21-FEB-97	$125,000.00	$243,946.00	
126548	XAN-4-13318-04	COLORADO SCHOOL OF MINES	GOLDEN	CO	06-APR-94	05-APR-97	$118,267.00	$242,907.00	
138666	XCF-5-14050-03	UNIVERSITY OF TENNESSEE	KNOXVILLE	TN	27-DEC-94	27-DEC-96	$241,374.00	$241,374.00	
117780	XAW-3-13441-01	AUBURN UNIVERSITY	AUBURN UNIVERSITY	AL	01-OCT-93	29-FEB-96	$230,150.00	$230,150.00	
111809	XAE-3-13186-01	MASSACHUSETTS INST OF TECHN	CAMBRIDGE	MA	07-MAY-93	07-JUL-95	$229,986.00	$229,986.00	
100120	XAD-2-11201-01	RUTGERS UNIVERSITY	PISCATAWAY	NJ	03-FEB-92	15-AUG-95	$220,273.13	$227,416.00	
137645	XAF-5-14076-03	UNIVERSITY OF ILLINOIS	CHAMPAIGN	IL	30-NOV-94	30-NOV-97	$60,000.00	$213,951.00	

NATIONAL RENEWABLE ENERGY LABORATORY
EDUC/UNIV ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
116359	XAC-3-13419-01	UNIVERSITY OF ROCHESTER	ROCHESTER	NY	23-AUG-93	01-OCT-95	$205,295.00	$205,295.00	
115320	XAI-3-11167-03	PRINCETON UNIVERSITY	PRINCETON	NJ	30-JUL-93	30-JUL-95	$199,357.00	$199,357.00	
105177	XAO-2-12236-01	UNIVERSITY OF COLORADO	BOULDER	CO	04-DEC-92	03-DEC-95	$182,393.00	$182,393.00	
136357	XAC-5-13363-01	VIRGINIA POLYTECHNIC INSTIT	BLACKSBURG	VA	31-OCT-94	30-OCT-96	$180,000.00	$180,000.00	
120097	AAP-4-11195-03	GOVERNING COUNCIL/UNIVERITY	TORONTO	ON	01-JAN-94	15-MAR-96	$177,857.48	$177,857.48	
126412	ZAU-4-13326-05	UNIVERSITY OF FLORIDA	GAINESVILLE	FL	01-APR-94	30-APR-95	$170,742.00	$170,742.00	170742
124781	XAW-4-14170-01	AUBURN UNIVERSITY	AUBURN UNIVERSITY	AL	24-FEB-94	31-AUG-95	$168,334.00	$168,334.00	
137008	XCF-5-14380-01	COLORADO SCHOOL OF MINES	GOLDEN	CO	11-NOV-94	11-JAN-97	$106,612.00	$161,501.00	
117947	XAE-3-13442-01	COLORADO SCHOOL OF MINES	GOLDEN	CO	23-SEP-93	28-FEB-96	$173,243.00	$159,952.00	
128825	XAW-4-14292-01	REGENTS-UNIV OF CALIFORNIA	BERKELEY	CA	23-MAY-94	30-APR-95	$154,570.00	$154,570.00	
117459	ZAC-3-13433-01	UNIVERSITY OF UTAH	SALT LAKE CITY	UT	13-SEP-93	13-OCT-95	$152,161.00	$152,161.00	26852
134360	XAC-4-13511-01	PURDUE RESEARCH FOUNDATION	WEST LAFAYETTE	IN	20-SEP-94	19-SEP-95	$149,217.00	$149,217.00	
100116	XAC-2-11179-01	RUTGERS UNIVERSITY	PISCATAWAY	NJ	31-JAN-92	31-AUG-95	$178,813.00	$143,813.00	7811
140850	XAC-5-15162-01	TRUSTEES OF DARTMOUTH COLLE	HANOVER	NH	14-FEB-95	14-FEB-96	$138,016.00	$138,016.00	
117650	XAP-3-11183-01	OREGON STATE UNIVERSITY	CORVALLIS	OR	17-SEP-93	17-APR-95	$128,495.00	$128,495.00	
100414	XAC-0-10012-01	UNIVERSITY OF COLORADO	BOULDER	CO	01-MAR-90	01-OCT-95	$64,755.69	$125,405.00	
115173	XAC-3-11185-01	COLORADO STATE UNIVERSITY	FORT COLLINS	CO	27-JUL-93	26-JUL-95	$124,482.00	$124,482.00	
118137	XAU-3-13343-01	UNIVERSITY OF HAWAII	HONOLULU	HI	28-SEP-93	27-SEP-95	$62,422.00	$122,757.00	
116214	XAW-3-11181-03	TEXAS ENGINEERING EXPERIMEN	COLLEGE STATION	TX	18-AUG-93	15-APR-95	$118,667.00	$118,667.00	
116225	XAD-3-13395-01	WICHITA STATE UNIVERSITY	WICHITA	KS	18-AUG-93	30-JUN-95	$110,632.00	$110,632.00	
119707	AAF-4-13301-01	ARIZONA BOARD OF REGENTS	TEMPE	AZ	29-OCT-93	13-NOV-95	$193,848.00	$108,848.00	
135565	AAX-5-14408-01	AIA/ACSA COUNCIL ON ARCHITE	WASHINGTON	DC	17-OCT-94	16-JUL-95	$40,000.00	$108,553.00	
112466	XAE-3-13245-01	UNIVERSITY OF NEW HAMPSHIRE	DURHAM	NH	24-MAY-93	23-AUG-95	$100,079.00	$100,079.00	
130369	XAW-4-14320-01	COLORADO STATE UNIVERSITY	FORT COLLINS	CO	29-JUN-94	30-JUN-95	$98,583.00	$98,583.00	
134995	XAF-4-14076-01	STANFORD UNIVERSITY	STANFORD	CA	29-SEP-94	28-SEP-95	$60,000.00	$97,953.00	
128444	XAN-4-13318-10	UNIVERSITY OF CALIFORNIA LO	LOS ANGELES	CA	13-MAY-94	16-MAY-97	$30,000.00	$90,000.00	
132482	XAR-4-14371-01	COLORADO SCHOOL OF MINES	GOLDEN	CO	04-AUG-94	14-MAY-95	$87,350.00	$87,350.00	
142556	XCI-5-15145-01	REGENTS-UNIV OF CALIFORNIA	DAVIS	CA	03-MAR-95	03-MAR-96	$85,282.00	$85,282.00	
142561	XCD-5-15144-01	REGENTS-UNIV OF COLORADO	BOULDER	CO	15-MAR-95	15-MAR-96	$79,809.00	$79,809.00	
142348	YAH-5-15113-01	CORNELL UNIVERSITY	ITHACA	NY	16-MAR-95	16-MAR-96	$75,002.00	$75,002.00	
133899	XAC-4-14386-01	UNIVERSITY OF TEXAS PERMIAN	ODESSA	TX	07-SEP-94	07-JUN-95	$75,000.00	$75,000.00	
135071	XAC-5-14411-01	UNIVERSITY OF UTAH	SALT LAKE CITY	UT	06-OCT-94	06-OCT-96	$74,309.00	$74,309.00	
142691	XCK-5-15163-01	UNIVERSITY OF IDAHO	MOSCOW	ID	24-MAR-95	24-MAR-96	$68,919.00	$68,919.00	
113765	XAC-3-13277-01	TEXAS A&M RESEARCH FOUNDATI	COLLEGE STATION	TX	24-JUN-93	23-MAY-95	$67,021.00	$67,021.00	
126419	XAR-4-14141-01	UNIVERSITY OF CHICAGO	CHICAGO	IL	04-APR-94	03-APR-95	$66,852.00	$66,852.00	
121643	XAE-3-13494-01	COLORADO SCHOOL OF MINES	GOLDEN	CO	07-DEC-93	01-SEP-95	$60,440.00	$60,440.00	
130416	XCG-4-14194-01	UNIVERSITY OF FLORIDA	GAINESVILLE	FL	30-JUN-94	29-JUN-95	$55,520.00	$55,520.00	
134629	ACC-4-14361-01	RUTGERS UNIVERSITY	PISCATAWAY	NJ	26-SEP-94	25-SEP-95	$55,145.33	$55,145.33	
127112	XAT-4-14138-01	UNIVERSITY OF COLORADO	BOULDER	CO	18-APR-94	17-APR-95	$55,000.00	$55,000.00	
135306	XCF-5-14360-01	CURATORS/UNIV MISSOURI AT C	COLUMBIA	MO	11-OCT-94	11-SEP-95	$54,682.00	$54,682.00	
134364	XAC-4-14242-01	MONTANA STATE UNIVERSITY	BOZEMAN	MT	20-SEP-94	20-APR-96	$47,677.00	$47,677.00	
134697	XCH-4-14406-01	GEORGE MASON UNIVERSITY	FAIRFAX	VA	28-SEP-94	28-SEP-96	$44,698.00	$44,698.00	
134124	ACC-4-14336-03	CORPORATION OF MERCER UNIVE	MACON	GA	14-SEP-94	12-SEP-95	$36,418.88	$36,418.88	
125120	AAL-4-14169-01	UNIVERSITY OF DENVER	DENVER	CO	04-MAR-94	15-DEC-95	$35,479.00	$35,479.00	
133244	XAT-4-14316-01	VIRGINIA POLYTECHNIC INSTIT	BLACKSBURG	VA	22-AUG-94	22-AUG-95	$35,000.00	$35,000.00	
138518	XAR-5-15058-01	UNIVERSITY OF COLORADO	BOULDER	CO	20-DEC-94	20-DEC-95	$27,908.00	$27,908.00	
140641	XCK-5-15114-01	PORTLAND STATE UNIVERSITY	PORTLAND	OR	06-FEB-95	06-JUL-95	$27,118.00	$27,118.00	
142013	XAE-5-15203-01	UNIVERSITY OF NEW MEXICO	ALBUQUERQUE	NM	09-MAR-95	09-SEP-95	$25,933.00	$25,933.00	
137245	XAX-5-14448-01	NEW MEXICO STATE UNIVERSITY	LAS CRUCES	NM	21-NOV-94	21-FEB-96	$23,529.00	$23,529.00	
128677	BAL-2-12287-05	COLORADO SCHOOL OF MINES	GOLDEN	CO	20-MAY-94	30-MAY-95	$23,004.00	$23,004.00	
125109	ACC-4-14180-01	ELIZABETH CITY STATE UNIVER	ELIZABETH CITY	NC	07-MAR-94	31-MAR-96	$22,905.49	$22,905.49	
128675	BAL-2-12287-06	COLORADO SCHOOL OF MINES	GOLDEN	CO	20-MAY-94	30-MAY-95	$22,849.00	$22,849.00	
119629	XAX-4-13471-01	PENNSYLVANIA STATE UNIVERSI	UNIVERSITY PARK	PA	27-OCT-93	25-APR-95	$22,000.00	$22,000.00	

NATIONAL RENEWABLE ENERGY LABORATORY
EDUC/UNIV ACTIVE SUBCONTRACTS

Po Number	Subc. Number	Vendor	City	State	Start Date	End Date	Funded Amount	Subc Amount	Cost Share
140089	AAF-5-14440-01	COLORADO STATE UNIVERSITY	FORT COLLINS	CO	31-JAN-95	31-JUL-95	$20,592.00	$20,592.00	
134989	AAX-4-14324-01	BOARD OF TRUSTEES/UNIVERSIT	CHAMPAIGN	IL	29-SEP-94	29-DEC-95	$14,902.00	$14,902.00	
133212	AAP-4-14335-01	COLORADO STATE UNIVERSITY	FORT COLLINS	CO	12-AUG-94	01-MAY-95	$13,913.00	$13,913.00	
142479	XCD-5-15151-01	UNIVERSITY OF CENTRAL FLORI	ORLANDO	FL	17-MAR-95	17-JUN-95	$13,023.00	$13,023.00	
137938	AAE-5-15040-01	MODULAR BUILDING INSTITUTE	CHARLOTTESVILLE	VA	05-DEC-94	05-MAY-95	$8,869.00	$8,869.00	
138544	AAE-5-15006-01	BOARD OF REGENTS/UNIV OF AR	TUCSON	AZ	14-DEC-94	14-AUG-95	$8,343.00	$8,343.00	
139096	ACK-5-15083-01	SUN POWER	WHEAT RIDGE	CO	06-JAN-95	06-APR-95	$6,975.00	$6,975.00	
127200	PAD-4-14093-17	ARIZONA STATE UNIVERSITY	TEMPE	AZ	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127214	PAD-4-14093-23	BOARD OF TRUSTEES/UNIVERSIT	URBANA	IL	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127186	PAD-4-14093-12	CALIFORNIA STATE UNIVERSITY	LOS ANGELES	CA	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127205	PAD-4-14093-19	DREXEL UNIVERSITY	PHILADELPHIA	PA	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127194	PAD-4-14093-15	GEORGE WASHINGTON UNIVERSIT	WASHINGTON	DC	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127175	PAD-4-14093-09	IOWA STATE UNIVERSITY	AMES	IA	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127222	PAD-4-14093-28	KAUAI COMMUNITY COLLEGE	LIHUE	HI	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127225	PAD-4-14093-29	MANKATO STATE UNIVERSITY	MANKATO	MN	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127120	PAD-4-14093-03	MERCER UNIVERSITY	MACON	GA	15-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127188	PAD-4-14093-13	NEW MEXICO INSTITUTE OF MIN	SOCORRO	NM	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127218	PAD-4-14093-25	OHIO STATE UNIVERSITY	COLUMBUS	OH	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127212	PAD-4-14093-22	PRAIRIE VIEW A&M UNIVERSITY	PRAIRIE VIEW	TX	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127202	PAD-4-14093-18	PURDUE UNIVERSITY	WEST LAFAYETTE	IN	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127124	PAD-4-14093-04	QUEENS UNIVERSITY	KINGSTON ONTARIO	CA	15-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127197	PAD-4-14093-16	ROSE-HULMAN INSTITUTE OF TE	TERRE HAUTE	IN	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127131	PAD-4-14093-06	SCOTTSDALE COMMUNITY COLLEG	SCOTTSDALE	AZ	15-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127171	PAD-4-14093-07	SOUTH DAKOTA SCHOOL OF MINE	RAPID CITY	SD	15-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127220	PAD-4-14093-26	STANFORD UNIVERSITY	STANFORD	CA	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127207	PAD-4-14093-20	UNIVERSIDAD NACIONAL AUTONO	MEXICO	DF	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127116	PAD-4-14093-02	UNIVERSITY OF CALIFORNIA AT	ALBANY	CA	15-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127216	PAD-4-14093-24	UNIVERSITY OF MARYLAND	COLLEGE PARK	MD	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127181	PAD-4-14093-10	UNIVERSITY OF MASSACHUSETTS	LOWELL	MA	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127192	PAD-4-14093-14	UNIVERSITY OF MICHIGAN	ANN ARBOR	MI	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127183	PAD-4-14093-11	UNIVERSITY OF MINNESOTA	MINNEAPOLIS	MN	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
129129	PAD-4-14093-27	UNIVERSITY OF MISSOURI - CO	COLUMBIA	MO	31-MAY-94	01-AUG-95	$3,000.00	$3,000.00	
127209	PAD-4-14093-21	UNIVERSITY OF MISSOURI ROLL	ROLLA	MO	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127173	PAD-4-14093-08	UNIVERSITY OF PUERTO RICO -	MAYAGUEZ	PU	15-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127126	PAD-4-14093-05	VIRGINIA POLYTECHNIC INSTIT	BLACKSBURG	VA	15-APR-94	01-AUG-95	$3,000.00	$3,000.00	
127227	PAD-4-14093-30	WESTERN MICHIGAN UNIVERSITY	KALAMAZOO	MI	18-APR-94	01-AUG-95	$3,000.00	$3,000.00	

NEW COMPANIES BASED ON NREL TECHNOLOGIES

Company/Type of Business	Established
Syngas, Inc. (Recently Changes to Tamal Energy) 1981 Commercial Gasification Systems	
Rentech, Inc. 1981 Gas Technologies	
Infinite Energy Consulting Services - Energy Conservation	1981
Pyrotech Corporation (now Energy Conversions, Inc.) 1984 Commercial Pyrolysis Reactors	
Glasstech Solar, Inc. 1985 Amorphous Silicon Production Systems	
Architectural Energy Corporation Architecture and Engineering	1985
Ocean Genetics Agar and Industrial Chemicals	1985
Rocky Mountain Analytical Laboratories Analytical and Measurement Services	1986
Industrial Solar Technology 1986 Solar Thermal Energy Systems	
Inland Mariculture Acuaculture	1986
Art Power & Associates Thermalchemical Process Development	1986

April 14, 1995

TDA Research, Inc.
1987
Chemical and Catalytic Process Development

DataQuest Corporation 1987
Software Systems

Photo-Catalytics 1987
Waste Treatment Systems

Barclay, Inc. 1987
Microbiological Products and Processes

Entropy Associates 1988
Consulting Services in Industrial Processes

Bell Chemical Research, Inc.* 1988
Specialized Photochemical Materials
*Acquired by TDA Research 1990

Filley Chemicals, Inc.
1988
Industrial Chemicals

M-V Systems
1989
Amorphous Silicon Production Systems

QuantiPhy, Inc. 1989
Algal pigments for medical diagnostics industry

Sea-Ag, Inc. 1989
Shellfish aquaculture

Nioptics, Inc.
1989
Nonimaging optics

Augustyn + Company, Inc.
1989
Radiometer Calibration Services

Tech International, Inc. 1990
Heat Transfer Systems

Environmental Research Groups International, Inc.
1988

April 14, 1995

Energy Efficient Building Design

Materials Research Group, Inc. Ultra High Vacuum Thin Film Deposition Systems	1992
KD Engineering Precision Machining and Product Engineering	1993

Lockheed
Idaho Technologies Company

W. John Denson, P.E.
President, Lockheed Idaho Technologies Company
Director, Idaho National Engineering Laboratory

P.O. Box 1625
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Telephone: (208) 526-4600
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June 6, 1995

The Honorable Dana Rohrabacher
Chairman
Subcommittee on Energy and Environment
Committee on Science
U. S. House of Representatives
Washington, DC 20515

RESPONSE TO QUESTIONS - WJD-100-95

Dear Chairman Rohrabacher:

Enclosed is our reply to your inquiry for further information on the Galvin Task Force Report hearings. My apologies for the timing of these answers; I had a critical illness in the family which took me away from my job for a while.

Sincerely,

W John Denson
W. John Denson
President, Lockheed Martin Idaho Technologies
Director, Idaho National Engineering Laboratory

js

Enclosure

QUESTIONS SUBMITTED BY MR. ROHRABACHER TO
W. JOHN DENSON, DIRECTOR
IDAHO NATIONAL ENGINEERING LABORATORY

1. What is Idaho National Engineering Laboratory's (INEL's) official mission statement?

2. The Galvin Task Force Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions.

   Would you concur that the INEL's mission suffers from such a lack of focus?

3. What are INEL's core competencies?

4. On Page 4 of the Galvin Task Force Report, it is stated that "{w}e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist."

   a. Do you share this Task Force belief, and if not, why not?

      4.a We do not concur. The Idaho National Engineering Laboratory and the other National Laboratories within the Department of Energy have had and continue to have significant ties to industrial research institutions and research universities. At the INEL, we have a consortium of Universities both regionally and nationally which support the research and applied engineering activities of the laboratory. This program, administered by Massachusetts Institute of Technology, provides directed research through a network of universities to support the technology programs at the INEL. The laboratory also invests in partnerships with industrial research as a way of advancing derived use technology and optimizing the investment dollars of the taxpayer. The INEL is related to over 150 universities in research supporting its programs at this time and 200 industrial research institutions. On any program, the division of labor varies depending on the research content. The INEL, and its national laboratory partners, are highly focused in not competing with private and university research capabilities, but rather to optimize these capabilities in efficiently and effectively achieving our program objectives within the Department of Energy. As in any area of business, there is always room for improvement, however, the focus of the INEL is to establish an appropriate division of Labor based on the needs of the particular program.

b. If you do concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where are we currently out-of-balance?

5. On page 19 of the Galvin Task Force Report, it is stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e., fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences)."

a. Would you concur with this statement, and if not, why not?

5.a The Idaho National Engineering Laboratory concurs with this statement. It must be pointed out that there is significant integration of activities between the laboratories at the program level at this time. The National laboratories are oriented toward securing the best talent to effectively carry out the programs of the department and nation. Increased integration at the mission level would certainly enhance laboratory effectiveness. The Secretary has established a Laboratory Operations Board, chaired by the Undersecretary with Assistant Secretaries as members, as well as outside members, to better integrate the missions and activities of the national laboratory system.

b. Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?

5.b These are operating alternatives and depend exclusively on the Secretary's approach to managing the Department. The Secretary of Energy is evaluating many options in the strategic alignment initiative. In this initiative, the DOE is evaluating its organization and operations to better focus them toward carrying out the DOE missions in the strategic plan. Many options are possible under this initiative.

6. On page 20 of the Galvin Task Force Report, it is stated that "{t}he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D."

Do you share this Task Force belief, and if not, why not?

6. This statement is true; however, it is not complete. Significant research projects are underway for environmental technologies to meet the challenge of restoring the weapons complex's environmental condition. The national security mission of the department and its laboratories is also a major area for research and science.

7. On page 20 of the Galvin Task Force Report, it is stated that "to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."

7. While we do not agree to the term "spreading the wealth", there is room for improvement. Over the last six months, under the guidance of the Undersecretary and Secretary, significant efforts have been undertaken to improve coordination and better focus the missions and activities of the system of laboratories. While the Galvin task force provided the impetus for this activity, it is now being firmly ingrained in the activities of the department and the laboratory system. Though much work remains, measurable progress is being made.

8. On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas"?

a. Do you concur with this Task Force statement, and if not, why not?

8.a We do not concur. The vitality of the research at the Idaho National Engineering Laboratory can be defined in one measure by the number of invention disclosure at the laboratory. In 1994, 192 inventions were disclosed. This number is expected to increase significantly in 1995 since we have 129 disclosures during the first six months. Since the INEL is an applied engineering laboratory, I would assume invention disclosure and patients at the pure research laboratories exceed those at the INEL. Publications in leading edge applied research activities are another measure. The INEL is significantly involved in the publication of research findings in energy research, environmental technology research and nuclear research. We do not believe that there has been a loss of vitality, simply, a loss of efficiency in moving the research forward at a pace compatible with industry. Much of the inefficiencies are driven by excessive oversight.

We concur that there has been an entitlements culture within the INEL relative to funding of research. We are moving the INEL to operate like a business research institution and are challenging the entitlements culture at every level. Research must be justified against the missions of the INEL and the Department of Energy. Significant progress has been made in moving from an entitlements culture to an entrepreneurial culture.

b. If you do concur, what specific research areas do you believe have suffered a loss of vitality?

8.b The vitality of the Idaho National Engineering Laboratory's research remains high and is improving in effectiveness and efficiency. Our relationship with the other National Laboratories implies that the vitality is high across the National Laboratory system.

9. We heard testimony during our budget hearings in February that DOE personnel could be reduced by one-third to one-half without harming mission performance.

a. Do you concur with the view that DOE personnel could be reduced by one-third to one-half without harming mission performance, and if not, what, if any, level of DOE personnel reductions would you recommend?

9.a The rightsizing of the contractors within DOE should be accompanied by the rightsizing of the civil servant work force. We have been able to reduce the work force at the INEL approximately 20 % and still achieve our missions. We have been advised that there is a plan for the parallel reduction of the civil service work force at the Laboratory. We believe that reductions could be made at headquarters and the field offices, but are not willing to speculate on a percentage since this must come from the evaluation of the DOE mission at each site and their planned oversight of the contractor. Less oversight would, in our opinion, improve efficiency.

b. Which areas of DOE personnel should/could be cut?

9.b Multiple layers of oversight could be cut substantially and would improve the efficiency of the DOE and its contractors. Removing the detailed "stove piping" of programs at headquarters should also be a candidate for some reduction. Elimination of a large percentage of the support contractors at DOE headquarters, while not direct headcount, should also be considered.

11. What specific DOE management practices would you alter to improve the efficiency of your laboratory?

11. The INEL contract allowed Lockheed to move toward incentive approaches to management with a corresponding reduction in oversight. This is one basis for the already accomplished rightsizing. The number of DOE orders which apply to the contract has been reduced with

corresponding gains in efficiency. DOE Headquarters, the Defense Nuclear Facility Safety Board, and other oversight agencies are redundant and cause many inefficiencies in the system. Reducing some of the redundancy of these oversight organizations and would undoubtedly result in efficiencies across the complex. The amount of reduction will define the level of efficiency to be achieved.

12. Out of every dollar appropriated to your laboratory, what is your best estimate of the fraction of that dollar that actually gets to the scientist doing the research?

12. The answer to this question can be framed many ways. When salary, benefits, laboratory equipment, facilities and required support services are included in this number, the percentage exceeds 80% at the INEL. If it is calculated as a fraction of the scientist or engineers salary to total cost, it approximates 45 to 50 percent at the INEL since we have low multipliers as a result of our rightsizing actions over the last six months.

DR. WILLIAM J. MADIA'S RESPONSE

* * *

COMMITTEE ON SCIENCE

SUBCOMMITTEE ON BASIC RESEARCH
AND
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

JOINT HEARING
ON
Alternative Futures for the Department of Energy National Laboratories
("The Galvin Report")
and
National Laboratories Need Clearer Missions and Better Management
(a GAO Report to the Secretary of Energy)

March 9, 1995

Follow-up Questions Submitted by Mr. Rohrabacher to

Dr. William J. Madia
Director
Pacific Northwest Laboratory

* * *

APRIL 12, 1995

1. **What is Pacific Northwest Laboratory's (PNL's) official mission statement?**

   Pacific Northwest Laboratory's mission is to deliver environmental science and technology in the service of the nation and to benefit humankind. We contribute to the fundamental understanding of the physical sciences and natural systems that provides the foundation both for development of environmental technology and for sound public policy. We deliver technologies that minimize the impact of energy production and utilization on the environment, that remediate environmental damage and mitigate existing environmental hazards, and that prevent pollution. We selectively apply our environmentally derived capabilities to meet national security needs, to help assure an affordable and environmentally acceptable energy supply, to contribute to human health, to strengthen the U.S. economy and to support the education of future scientists and engineers.

2. **The Galvin Task Force Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions.**

   Would you concur that the PNL's mission suffers from such a lack of focus?

   I concur with the thoughtful approach to mission definition contained in the report. The Galvin Task Force report indeed calls for increased clarity and focus in the missions of the individual laboratories, and for each institution to focus on areas of strength. The Task Force takes care to note, however, "...that there are important and practical limitations on how narrow one can be in delineating missions for multiprogram laboratories...", "does not seek to force specialization that would fundamentally jeopardize the multi-attribute character of these institutions", and explicitly recognizes "the value of competition in spurring innovation".

   In this context our mission is well focused. Pacific Northwest Laboratory is strongly aligned with the environmental mission as articulated in our mission statement above, with roughly two-thirds of our work falling into our environmental science and technologies program. Our energy programs derive from our environmental work. Our national security programs, concentrated on arms control and nonproliferation, also leverage our environmental science and technology capabilities. For example, sensors initially developed to detect very low concentrations of radioactive contaminants in the environment are also effective in detection of proliferant behavior.

   In summary, we are strongly focused on our environmental mission. Our energy and national security programs provide cost-effective leveraging of our environmentally derived capabilities to meet national needs. This is not to say, however, that our ongoing effort to focus our capabilities is finished. We continue to review both our programmatic workload and our technical capabilities for quality and relevance to national needs.

3. **What are PNL's core competencies?**

PNL has articulated three high level core competencies, each central to fulfillment of our mission, as follows:

- *Integrated Environmental Research*, encompassing the capabilities necessary to provide a whole system approach to environmental issues, including sensing and measurement of environmental contaminants, characterization of physical processes in the earth's interior, ocean, and atmosphere, the transport and fate of contaminants in the environment, the interaction of biological or ecological systems with their physical environment, and the technical, economic, and regulatory analysis of policy alternatives.

- *Process Science and Technology*, encompassing the capabilities necessary to develop process technology for environmental remediation and pollution prevention, including advanced chemical separations, the mechanics of complex fluids, selected aspects of catalysis, selected aspects of materials science, and process design and testing.

- *Energy Systems Development*, encompassing the capabilities necessary to design and efficiently operate environmentally benign energy generation, distribution, and utilization technologies, including automated diagnostics and controls, buildings science, power system engineering, and selected aspects of materials engineering and specialty component fabrication.

This set of core competencies is based on a foundation of twenty core technical capabilities roughly corresponding to technical disciplines or subdisciplines. We manage our technical base at this finer level of detail through regular assessments of the quality and relevance to our mission of each core technical capability.

4. **On page 4 of the Galvin Task Force Report, it is stated that "[w]e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist."**

a. **Do you share this Task Force belief, and if not, why not?**

The Galvin Task Force is correct in that there is no simple, clearly articulated, and publicly accepted definition of the relative roles of the national laboratories, industry, and research universities. There is, however, a rough de facto division of labor between the national laboratories, industrial research institutions, and universities that has evolved over time and that I believe makes sense. At the risk of oversimplifying, this division might be articulated as follows:

- Research universities concentrate on investigator-initiated research, usually falling within disciplinary boundaries. Projects tend to be long-term and fundamental in nature, and, in most fields, involve relatively few researchers. They are often motivated by the scientific interests of the principal investigators, and, in most cases, do not require delivery of clearly specified results on a specific schedule.

- Industrial research is strongly focused on development of new commercial products and enhancements of existing products. Although some longer term research activities are carried out in industrial laboratories, in general there is a clear tie to future products or to production technology.

- The national laboratories carry out mission-oriented research and development activities to meet national needs. Major programs are often highly interdisciplinary, frequently large or logistically complex, and are generally directed towards achieving clearly articulated science or technology goals. The laboratories also develop and operate major scientific user facilities on behalf of all three classes of research institutions.

The boundaries between these kinds of research institutions are clearly not firm, nor do I believe they should be. Industrial researchers have contributed a number of fundamental advances. Certain user facilities are operated with distinction by university consortia, and university researchers do carry out well-defined projects for a variety of sponsors. The national laboratories are home to a number of highly distinguished and productive investigator initiated basic research programs.

Partnerships between different classes of research institutions are frequent and productive, and should be encouraged. Attempts to force clear and arbitrary distinctions, on the other hand, are likely to prove harmful to the vitality, flexibility, and productivity of all three classes of institutions.

b. **If you concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where are we currently out-of-balance?**

I believe that a market approach, in which research is assigned on the basis of quality and productivity, will address any division of labor issues.

5. **On page 19 of the Galvin Task Force Report, it stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences)."**

a. **Would you concur with this statement, and if not, why not?**

I concur with the Galvin Task Force that a well-integrated and robust energy research program that maintains a broad portfolio of options for meeting future energy needs while protecting our economic and environmental security is in the national interest. I further concur that there may be insufficient integration of the existing applied energy programs, and that in some cases they are insufficiently well-connected to basic energy research.

b. **Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?**

I concur with the Task Force view (articulated on pages 20 and 21of the report) that clear national policy goals and a portfolio management approach are key to effective management of our energy research investments. I support the Task Force recommendation in this regard as presented on page 25. A clear set of national objectives and maintenance of a corresponding strategic plan is critical to effective integration and portfolio management. Organizational structure is probably a secondary consideration.

6. **On Page 20 of the Galvin Task Force Report, it is stated that "[t]he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy resources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D."**

Do you share this Task Force believe, and if not, why not?

I believe that a broad research program in energy production, generation, distribution, and conservation, encompassing the technologies enumerated by the Task Force, is in the national interest and merits high priority in planning the federal R&D investment. However, to assert that the list of energy technologies given above should be the highest priority for the Department or the laboratories is too narrow a reading of the Task Force report, and certainly too confining a definition of the laboratories' role.

The Task Force clearly articulates a strong rationale for the national security, environmental, and science missions of the laboratories, and I do not believe the Task Force intends to give absolute priority to the energy mission except perhaps in the very broadest sense as defined in the introduction (page 2). Further, and as the Task Force report repeatedly emphasizes, there is a strong linkage between energy, the environment, and our economic well-being. The Task Force recommends (page 25) that "The integration of energy and environmental considerations should be a fundamental organizing principle for much of the Department's activities." An appropriate energy R&D agenda, both in view and as articulated by the Task Force, encompasses the environmental consequences of alternative strategies for supplying the nation's and world's energy needs, the development of pollution-avoiding technologies, and the underlying science necessary to support this suite of activities.

7. **On page 25 of the Galvin Task Force Report, it is stated that "to-date there seems to have been a pattern of spreading the wealth across the multilaboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."**

Do you concur with this Task Force statement, and if not, why not?

I do not concur with this observation as stated, and in particular it is not correct for PNL. PNL is not block funded; rather, each individual research program is independently funded. We must compete on the basis of quality, productivity, and relevance for every one of our programs.

With regard to the laboratory system as a whole I also note the following:

- Programs funded by Energy Research are generally awarded through competitive peer review. This practice is the antithesis of "share the wealth".
- The user facilities located at the laboratories are not duplicative, and constitute "Centers of Excellence". These investments, also, bear no resemblance to a "share the wealth" paradigm.

- Although core competencies and programs at different laboratories often have similar names, close examination usually reveals that there are significant differences in technical capability and programmatic content. Many leading research universities have chemistry or physics departments without, however, duplicating each other's research programs. In the same vein, although core competencies and programs at different laboratories often have similar names, close examination usually reveals that there are significant differences in technical capability and programmatic content. As just one example, both Pacific Northwest Laboratory and Lawrence Berkeley Laboratory have strong capabilities in chemical physics and the study of chemical reactions. However, PNL's programs develop knowledge required to understand the behavior of chemical contaminants in the environment whereas LBL specializes in such areas as combustion phenomena.

However, I do concur with the Task Force that the there are opportunities to better manage the laboratories as a system, and indeed the laboratories are moving in this direction. A number of major programs are managed as integrated cross-system efforts. Let me give four examples of what I consider to be effective management models for major programs that draw on the capabilities of multiple laboratories, or, in some cases, the entire laboratory system.

- The Atmospheric Radiation Measurements program, or ARM, is an intensive field investigation designed to improve our understanding of energy transport in our atmosphere, and hence improve our understanding of the factors governing climate. In this logistically complex program a multi-laboratory team is developing and operating suites of sophisticated instrumentation at several field sites around the world. The ARM science team, composed of distinguished laboratory, university, and industrial investigators selected through an open competitive peer review process, conducts research at these unique facilities.

- The AMTEX partnership between DOE and the integrated textile industry brings project teams selected from across the laboratory system to work major technical challenges selected by the industry. Project managers at any of the laboratories lead teams that often include staff from as many as half a dozen laboratories, and use experimental facilities from across the laboratory complex.

- Several major technology development programs in support of DOE's environmental remediation mission are now carried out as cross-system collaboration. For example, development of technology for dealing with the waste tanks at Hanford and elsewhere in the DOE complex is now carried out via a partnership involving multiple laboratories. This partnership also has responsibility for bringing the best existing academic or industrial technology to bear.

- The International Reactor Safety Program supports our effort to reduce the danger associated with the operation of potentially unsafe nuclear reactors in the Former Soviet Union. This program is executed as a partnership based on unique technical resources at PNL, Brookhaven, and Argonne, and also draws heavily on the technical capabilities of the U.S. nuclear industry.

We and several other laboratories are also undertaking initiatives in line with the Task Force observation (page 25) that there is considerable potential to achieve greater coordination across the system through the effective application of advanced information technology.

8. **On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas."**

    a. **Do you concur with this Task Force statement, and if not, why not?**
    b. **If you do concur, what specific research areas do you believe have suffered a loss of vitality?**

Based on the results we deliver, I can make a clear and compelling case that PNL is a vital and productive institution, and I would be delighted to accept any available opportunity to prove this to Committee members or staff.

Neither PNL as an institution nor PNL staff have any sense of entitlement to research funds. As noted above, we are funded program by program, and must compete for every research dollar that is invested here. Our research and development work is funded only to the extent that we are the most relevant and productive providers of that work available. We have the strongest possible incentive to perform, to focus our efforts, and to maintain leading edge technical capabilities. This entrepreneurial management approach is based on our parent, Battelle's, sixty-six years of contract research experience for industrial and government clients. Our Battelle heritage is one of customer focus and disciplined project performance. I would not want it any other way.

Finally, I should note that although our location is remote we are an integral part of the international technical community. PNL researchers publish regularly in the open literature, and many hold leadership roles in national professional societies. We host many hundreds of collaborators and technical visitors from around the world each year, and provide temporary research appointments to visiting faculty and, again, hundreds of students each year. A significant share of our research programs are carried out in collaboration with university or industrial partners from across the nation.

9. **We heard testimony during our budget hearings in February that DOE personnel could be reduced by one-third to one-half without harming missions performance.**

   a. **Do you concur with the view that DOE personnel could be reduced by one-third to one-half without harming mission performance, and if not, what, if any, level of DOE personnel reductions would you recommend?**

   b. **Which areas of DOE personnel should/could be cut?**

   In general, as we collectively adopt more efficient management practices in line with Appendix B of the Task Force report I anticipate that there will be opportunities for substantial reduction of nontechnical staff both within DOE and at each of the laboratories. In some cases current practice is driven by congressional direction, and some reductions may require congressional action. I do not, however, have the data necessary to evaluate the appropriate overall level of DOE staffing.

   In achieving reductions it is critical that we focus on eliminating work that is of low value with respect to accomplishment of missions. Thorough and thoughtful analysis of the value of work, followed by reduction or elimination of low value work and enhancement of the processes through which we accomplish work of high value is the appropriate step. Industrial experience of the last few years shows that organizations that focus on identifying and taking out low value work often obtain substantial savings without impacting mission performance. It is exactly this process that we are undertaking at PNL.

10. **What specific DOE management practices would you alter to improve the efficiency of your Laboratory?**

We have provided to the Department five general recommendations, each of which we believe will allow us to improve the efficiency of PNL. These recommendations, which are highly consistent with the Task Force, report are as follows:

- Reestablish the essential concepts of the GOCO model. Under the original concept, the government established mission objectives and provided funding, and the private sector carried out that mission using its best business practices.

- Hold laboratory contractors accountable to the same operational standards (Conduct of Operations, ES&H, etc.) that govern similar private industry operations. The existing DOE directive system is overly prescriptive, contains duplication, and in many cases exceeds current industrial standards, resulting in significant inefficiencies and radically higher operating costs across the laboratory complex.

- Continuously update management performance data from relevant government, industry, and academic organizations to serve as operational performance targets for operating contractors. These data, coupled with consistently derived quality, timeliness, and cost-effectiveness feedback from the S&T customers, will provide an appropriate basis for measuring contractor performance.

- Use the same process to measure the performance of all laboratories. DOE should encourage contractors to embrace a principle-based management culture and should evaluate overall laboratory performance on a common basis. Common measurements based on clearly stated outcome-oriented objectives and system-wide benchmark data would also provide DOE with a more direct basis for making important extend/compete decisions.

- Wherever possible, eliminate mandated service monopolies such as requirements to use designated service providers. Instead, DOE should expect managing contractors to bring their own purchasing power and best procurement practices to the table and judge them on the outcome, not on the process. Although new or modified legislation may be required in some cases, such as eliminating the need to use government printing office facilities, for example, we believe the benefits would well be worth such an effort.

I should stress, however, that it is not only the Department that must alter management practices. At PNL we are engaged in a detailed review of both our administrative and research practices, and find that there are a variety of steps that we can take to improve productivity. Some of these steps require cooperation from the Department but we can implement many of them independently.

11. Out of every dollar appropriated to your laboratory, what is your best estimate of the fraction of that dollar that actually gets to the scientist doing the research?

Estimates of the fraction of resources going to working scientists depends on a number of subjective assumptions and specific cost allocation or accounting practices, which can vary from institution to institution. Different assumptions or practices can lead to different results. Accordingly, the following estimate should be regarded as approximate, and is comparable to estimates provided by other organizations only to the extent that similar assumptions and practices are used.

Roughly speaking, our research dollar breaks down as follows:

- two-thirds goes to the accomplishment of technical workscope
- one-quarter goes to administrative activities
- one-twelfth goes to facilities and utility costs.

We are currently engaged in a very thorough analysis of our work processes and the costs associated with those processes. This analysis will allow us to answer questions of the kind posed here more reliably and more accurately. Detailed results will be available within a few months.

BROOKHAVEN NATIONAL LABORATORY
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Office of the Director

April 11, 1995

Mr. Dana Rohrabacher
Chairman
Energy and Environment Subcommittee
Committee on Science
Suite 2320 Rayburn House Office Building
Washington, D.C. 20515-6301

Dear Mr. Rohrabacher:

The following is in response to your additional questions in connection to my testimony on March 9, 1995.

1. **What is Brookhaven National Laboratory's (BNL's) official mission statement?**

3. **What are BNL's core competencies?**

Answer.

I would like to respond to Questions 1 and 3 by enclosing a few pages from our Institutional Plan that define our mission and its relation to our four major core competencies and then expands in greater detail what comprises those competencies. We also show in a table the relationship between those detailed subpieces of the core competencies and the overall DOE mission.

2. **The Galvin Task Force Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions.**

   Would you concur that the BNL's mission suffers from such a lack of focus?

Answer.

In response to Question 2, we believe that the mission and core competencies at Brookhaven are well focused and have been relatively constant. We have been mainly a laboratory devoted to user facilities for the scientific community and a research center for multidisciplinary research centered about these facilities. That has been a constant focus as we retired older facilities and designed, built and operated newer ones in order to keep the U.S. scientific community on the cutting edge. The facilities and the research has changed as the science has changed but our role has not.

4. **On page 4 of the Galvin Task Force Report, it is stated that "[w]e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist."**

    a. **Do you share this Task Force belief, and if not, why not?**

    b. **If you do concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where are we currently out-of balance?**

Answer.

The balance of efforts at the national laboratories, the industrial laboratories and the universities is difficult to judge since it varies considerably among the different fields of science. That balance is reviewed by DOE program officers and periodically by DOE advisory committees. I believe that the balance, while it might not be perfect, is reasonable.

5. **On page 19 of the Galvin Task Force Report, it is stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences)."**

    a. **Would you concur with this statement, and if not, why not?**

    b. **Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?**

Answer.

I concur that an important challenge of the DOE is to better integrate its science and technology programs. The DOE's proposal for an Operating Board for the labs, which will have all the relevant Assistant Secretaries under the Chairmanship of the Under Secretary is an important step in that direction.

6. On page 20 of the Galvin Task Force Report, it is stated that "[t]he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D."

Do you share this Task Force belief, and if not, why not?

Answer.

It is important to realize that breakthroughs in the critical technologies depend on the efforts in the basic research sector. Therefore, basic research should also be one of the highest priority areas. A reasonable balance between the technology efforts and the basic research efforts requires care.

7. On page 25 of the Galvin Task Force Report, it is stated that "to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."

Do you concur with this Task Force statement, and if not, why not?

Answer.

I do not agree with the implication of the statement. It implies that one would get more bang for the buck if resources were concentrated rather than distributed among the labs. If the labs had subcritical size of research teams, then that would be true. If, as is the case in most, there are critical sizes to the teams, then the competition among the teams drives the system to high performance. Competition in science is as useful as competition in business in rewarding the good performers. It should be maintained not diminished.

8. On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas"?

a. Do you concur with this Task Force statement, and if not, why not?

b. If you do concur, what specific research areas do you believe have suffered a loss of vitality?

Answer.

I disagree with this statement. Our laboratory does not work in isolation, either physically or intellectually from the science community. We are a user based laboratory. We are constantly interacting with our more than 3,000 users of our facilities, by providing unique resources for their research and in active collaborations. Our user advisory committees are constantly involved in our planning for facility improvements. Approval for running at these facilities is determined by reviews by our program committees which are mainly composed of the user community. We are strongly coupled to the scientific community, through university and industrial users.

Should you require any additional information or clarification, please let me know.

Sincerely,

N. P. Samios

N. P. Samios
Director

Enclosure: Pages from BNL's Institutional Plan

MISSIONS AND CORE COMPETENCIES

Our Laboratory's mission is to support the basic Department of Energy activities through our leading-edge user research facilities, our research and technology development, our educational efforts, and industrial involvement. We were founded as a laboratory which would provide specialized research facilities that could not be designed, built and operated at a university or industrial complex, and this still remains a basic mission of the Laboratory.

Brookhaven's four core competencies, Research Facilities, Scientific Research, Technology Development, and Knowledge Transfer, which are described in detail in the following pages, are not independent isolated competencies. They are interrelated in a complex manner. Research Facilities and Scientific Research have a synergistic relationship. To maintain and constantly improve a research facility, to keep it at the cutting edge, it is essential that the Laboratory have a significant research staff of excellent stature. That staff will drive the performance of the facility. Having the several complementary facilities at one location, such as the National Synchrotron Light Source and the High Flux Beam Reactor, allows a unique research capability such as in material science and biological structure determination. Our other two core competencies, Technology Development and Knowledge Transfer, cut across all of the research facilities and research programs.

Our core competencies support and cut across the five central activities of the Department of Energy, as defined in its Strategic Plan, playing a major role in the Science and Technology, the Environmental Quality, the Industrial Competitiveness and the Energy Resources sectors, with a smaller but special role in the National Security arena.

In order to better see the connection between the various Brookhaven activities that form our core competencies and the Department of Energy core activities we label each broad competency with the following letter code describing the match.

SCI	Science and Technology
ENV	Environmental Quality
IND	Industrial Competitiveness
ENER	Energy Resources
SEC	National Security

At the end of this section we present a matrix showing the correlation between DOE's major business areas and the sections within each of our Laboratory's core competencies.

MAJOR CORE COMPETENCIES

RESEARCH FACILITIES

Expertise to conceive, design, build and operate complex leading-edge, user-oriented research facilities in a safe and environmentally responsible manner.

SCIENTIFIC RESEARCH

Expertise to carry out basic and applied scientific research in long-term, high-risk programs. This is an essential capability needed to keep our research facilities at the leading edge. These programs lead to new insights and technological advances which provide the underlying scientific base for the DOE missions and generate long-term benefit to the nation.

TECHNOLOGY DEVELOPMENT

Expertise to develop advanced technologies that address national needs, support and strengthen the ability of DOE to carry out its missions, support other federal and state agencies, and enable industry to benefit from the multidisciplinary research and development at the Laboratory.

KNOWLEDGE TRANSFER

Expertise and mechanisms for disseminating scientific and technical knowledge to educate new generations of scientists and engineers, to produce a technically trained work force, to enhance scientific literacy of the general public, and to improve the competitiveness of U.S. industry.

MAJOR ACTIVITY CLUSTERS

RESEARCH FACILITIES

LARGE FACILITIES

ALTERNATING GRADIENT SYNCHROTRON (SCI)

- Research in Particle and Nuclear Physics
- High-Intensity Frontier of Particle Physics
- World's Only High Energy Polarized Proton Source
- At Present, Nation's Only High Energy, Heavy Ion Synchrotron
- Over 800 Users

RELATIVISTIC HEAVY ION COLLIDER (under construction) (SCI)

- High-Temperature Frontier of Nuclear Matter
- Large and Unique High Energy Physics Potential (e.g., spin physics)
- 600 Users in First Round Experiments

HIGH FLUX BEAM REACTOR (SCI, ENER, ENV, IND)

- Instruments for Research in Condensed-Matter Physics, Biology, Chemistry, Applied Sciences and Industrial Applications
- 270 users

NATIONAL SYNCHROTRON LIGHT SOURCE (SCI, ENV, ENER, IND)

- Two Storage Rings Providing Intense UV and X-ray Photon Sources
- Instruments for Research in Materials Science, Biology, Chemistry, Medical and Industrial Applications
- Over 3300 Users, Including 400 Industrial Users

BIOMEDICAL FACILITIES

PET-CYCLOTRON CENTER (SCI, IND)

- Medical Imaging for Basic Neuroscience and Substance Abuse, Radiotracer Synthesis

BROOKHAVEN LINEAR ISOTOPE PRODUCTION FACILITY (SCI, IND)

- Production of Isotopes for Medical Purposes
- Approximately 20 Isotopes Produced for Commercial and/or Research Use

MEDICAL RADIATION FACILITY (SCI, IND)
- Cancer Patient Treatment: 250 patients annually

BROOKHAVEN MEDICAL RESEARCH REACTOR (SCI, IND)
- Neutron Capture Cancer Therapy Research

SCANNING TRANSMISSION ELECTRON MICROSCOPE (SCI, IND)
- Structural Biology, Molecular Masses
- Over 75 Users

PROTEIN DATA BANK (SCI, IND)
- World-Wide Repository for Three-Dimensional Structures of Biological Macromolecules

GENOME SEQUENCING CENTER (under development) (SCI, IND)
- Large-Scale DNA Sequencing

PROTON RADIATION THERAPY FACILITY (under development) (SCI, IND)
- Utilizes Existing 200 MeV Linac
- Will Consist of Horizontal and Vertical Beam Treatment Rooms
- Capability of 900 Cancer Patients Per Year

OTHER FACILITIES

TANDEM VAN DE GRAAFF FACILITY (SCI, SEC, ENV, ENER, IND)
- Microchip Radiation Testing Facility
- Film Irradiation Plant for Track Etching Filter Membranes
- 250 Industrial Users from 45 Institutions

ACCELERATOR TEST FACILITY (SCI, IND, SEC)
- Advanced Acceleration Concepts

10-MEV ELECTRON PULSE RADIOLYSIS FACILITY (under construction) (SCI, ENER, ENV)
- Study of Rapid Chemical Reactions: Catalysis, Energy Conversion and Storage

NUCLEAR DATA COMPILATION AND EVALUATION CENTER (SCI, SEC, IND)
- Nuclear Cross-Section and Structure Data
- 1100 Users

MAJOR ACTIVITY CLUSTERS

SCIENTIFIC RESEARCH

HIGH ENERGY PARTICLE AND NUCLEAR PHYSICS (SCI)

- Beyond the Standard Model
  - Rare Kaon Decays
  - Muon Anomalous Magnetic Moment
  - Exotics and Glueball Spectroscopy
  - Neutrino Oscillations
  - Strange Matter
  - Solar Neutrinos
- Relativistic Heavy Ions
  - High-Temperature Nuclear Matter
  - Quark-Gluon Plasma

ADVANCED ACCELERATOR CONCEPTS (SCI, IND, SEC)

- Short Wavelength Accelerating Structures
- Production of Coherent Radiation Free Electron Laser

MATERIALS SCIENCES (SCI, ENER, IND)

- Materials Characterization with Neutron and X-ray Scattering, Magnetism and Superconductivity, Surface Studies, Corrosion, Adhesion, Catalysis, Metallic Alloys, Polymers

CHEMICAL SCIENCES (SCI, ENER, IND, ENV)

- Molecular Dynamics, Reactive Transient Species, Thermal and Photo- Induced Charge Transfer, Structure and Reactivity

ENVIRONMENTAL SCIENCES (SCI, ENV, IND)

- Global Change, Atmospheric Chemistry, Oceanography, Soil Chemistry, Cycling of Pollutants, Environmental Remediation

MEDICAL SCIENCE (SCI, IND)

- Medical Imaging: PET, SPECT, MRI, Coronary Angiography
- Nuclear Medicine
- Radionuclides, Radiopharmaceuticals, Synthesis and Applications
- Advanced Cancer Therapies: Neutron Capture, Microbeam Radiation, Proton Radiation
- Mechanisms of Oncogenesis

MOLECULAR BIOLOGY AND BIOTECHNOLOGY (SCI, IND)

- Genome Structure, Gene Expression
- DNA Damage and Repair
- Molecular Genetics
- Plant Science
- Bio-Structure Determination by X-ray and Neutron Scattering
- Enzyme Kinetics by Laue Crystallography
- Mass Measurements by Electron Microscopy

ADVANCED SCIENTIFIC COMPUTING AND SYSTEMS ANALYSIS (SCI, IND, ENV, ENER)

- Risk Assessment
- Energy Modeling
- Groundwater Modeling

MAJOR ACTIVITY CLUSTERS

TECHNOLOGY DEVELOPMENT

PHYSICAL, CHEMICAL AND MATERIALS SCIENCE (SCI, ENER, IND)

- State-of-the-Art Instrumentation and Devices for Precision Electronics, Optics and Microelectronics
- Superconducting Materials
- X-ray Lithography
- Micromachining
- Battery Technology
- Permanent Magnets
- "Smart" Polymers

ACCELERATOR TECHNOLOGY (SCI, IND, SEC)

- High-Field, High-Quality Superconducting Magnets
- High-Power Radio Frequency Systems
- Ultrahigh Vacuum Systems
- Advanced Accelerator Designs
  - High-Gradient Acceleration
  - High-Beam Current Acceleration

ENVIRONMENTAL AND CONSERVATION TECHNOLOGIES

(SCI, ENV, ENER, IND, SEC)

- Environmental Remediation and Mitigation
- Energy-Efficiency Technologies
- Waste Treatment
- Disposal of Nuclear Materials
- Radiation Protection
- Infrastructure Modernization
- Transportation: Intelligent Vehicle Highway System, MAGLEV

MEDICAL TECHNOLOGIES (SCI, IND)

- Biomedical Applications of Nuclear Technology
- Production of Radionuclides/Radiopharmaceuticals
- Development of Particle Radiation Therapies for Cancer
- Medical Imaging
- X-ray Microbeam Therapy

BIOTECHNOLOGY (SCI, IND)

- Neutron and Synchrotron X-ray Scattering
- Large-Scale Genome Sequencing
- High-Resolution Scanning and Cryo Electron Microscopy
- Cloning, Expressing and Engineering Genes
- Metal Cluster Compounds for Electron Microscope Labels
- Phage Displays for Probing Specific Interactions

SAFETY AND RISK ASSESSMENT (SEC, SCI, ENV, ENER)

- Safeguards, Nonproliferation and Arms Control
- Safety Analysis of Complex Systems
- Probabilistic Risk Assessment

MAJOR ACTIVITY CLUSTERS

KNOWLEDGE TRANSFER

EDUCATING FUTURE GENERATIONS OF SCIENTISTS AND ENGINEERS

(SCI, ENV, IND, ENER, SEC)

- Scientific Publishing, Lecturing, Conference Participation
- Visiting Scientist Program

- Accelerator Fellowship Program
- Postdoctoral Research Associates
- Engineering Intern Program
- Graduate Student Thesis Projects
- Adjunct Teaching Appointments at Local Colleges
- Office of Educational Programs
    - Precollege and College Programs for Students and Teachers

EDUCATING THE GENERAL PUBLIC (SCI, ENV, IND, ENER, SEC)

- Science Museum and Laboratory Tours (20,000 people/year)
- Speakers Bureau
- BNL Videos
- Laboratory Lectures for the Public
- Community Outreach Programs

TECHNOLOGY TRANSFER TO INDUSTRY (SCI, ENV, IND, ENER, SEC)

- Scientific Publishing
- Industrial Users at the Research Facilities
- Consulting by Scientific Staff
- Technology Transfer Office
    - Patenting and Licensing Office
    - Technical Assistance for Industry
    - CRADAs
    - Visiting Scientist Program with Industry
    - Research Partnerships with Industry
    - Industry-Sponsored Proprietary Research and Development
- Long Island Research Institute (LIRI) (founding member)
    - Promotes Laboratory-Industry Interaction
    - ARPA-Funded BNL/LIRI Defense Conversion Project
    - NY State-Funded Biotechnology Initiative

INFORMATION TECHNOLOGY (SCI, ENV, IND, ENER, SEC)

- Electronic Library and Database Information Source
- Networking - "Information Superhighway"
- Technical and Scientific Publishing
- National Nuclear Data Center
- Protein Data Bank

	Science and Technology	Environmental Quality	Energy Resources	Industrial Competitiveness	National Security
Research Facilities					
• Alternating Gradient Synchrotron	X				
• Relativistic Heavy Ion Collider (under construction)	X				
• High Flux Beam Reactor	X	X	X	X	
• National Synchrotron Light Source	X	X	X	X	
• Pet-Cyclotron Center	X			X	
• Brookhaven Linear Isotope Production Facility	X			X	
• Medical Radiation Facility	X			X	
• Brookhaven Medical Research Reactor	X			X	
• Scanning Transmission Electron Microscope	X			X	
• Protein Data Bank	X			X	
• Genome Sequencing Center (under development)	X			X	
• Proton Radiation Therapy Facility (under development)	X			X	
• Tandem Van De Graaff Facility	X	X	X	X	X
• Accelerator Test Facility	X			X	X
• 10 MeV Electron Pulse Radiolysis Facility (under construction)	X	X	X		
• Nuclear Data Compilation and Evaluation Center	X			X	X
Scientific Research					
• High Energy Particle and Nuclear Physics	X				
• Advanced Accelerator Concepts	X			X	X
• Materials Sciences	X		X	X	
• Chemical Sciences	X	X	X	X	
• Environmental Sciences	X	X		X	
• Medical Science	X			X	
• Molecular Biology and Biotechnology	X			X	
• Advanced Scientific Computing and Systems Analysis	X	X	X	X	
Technology Development					
• Physical, Chemical and Materials Science	X		X	X	
• Accelerator Technology	X			X	X
• Environmental and Conservation Technologies	X	X	X	X	X
• Medical Technologies	X			X	
• Biotechnology	X			X	
• Safety and Risk Assessment	X	X	X		X
Knowledge Transfer					
• Educating Future Generations of Scientists	X	X	X	X	X
• Educating the General Public	X	X	X	X	X
• Technology Transfer to Industry	X	X	X	X	X
• Information Technology	X	X	X	X	X

BROOKHAVEN NATIONAL LABORATORY bnl
ASSOCIATED UNIVERSITIES, INC. aui

Committee on Science

Subcommittee on Basic Research
and
Subcommittee on Energy and Environment

Joint Hearing
on
Alternative Futures for the Department of Energy National Laboratories
("The Galvin Report")
and
National Laboratories Need Clearer Missions and Better Management
(a GAO Report to the Secretary of Energy)

Answers to Mr. Rohrabacher's Followup Questions from
Dr. Alan Schriesheim, Director
Argonne National Laboratory

1. ***What is Argonne National Laboratory's (ANL's) official mission statement?***

   See pp. 5-6 of the enclosed Argonne *Institutional Plan* for October 1994.

2. ***The Galvin Task Force Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions. Would you concur that the ANL's mission suffers from such a lack of focus?***

Argonne's facilities and R&D programs have clearly defined technical objectives that contribute importantly and uniquely to national programs of the Department of Energy. In this crucial sense, Argonne's missions are well focused.

The Galvin Task Force Report recommends that the multiprogram laboratories each concentrate more exclusively on particular DOE mission areas or program areas. This movement toward Centers of Excellence and greater reliance on lead laboratories may well have some advantages, though opportunities will differ from program to program. Movement in this direction should be implemented smoothly, as new program assignments are made, to avoid inefficient disruption of existing programs.

DOE's new Lab Operating Board will be considering greater focus in missions at the same time that it is considering downsizing of the laboratories. Coordinated consideration of these two issues is clearly appropriate, but it is important to understand that efficiencies achievable by concentrating missions will be small relative to the magnitudes of downsizing that some are suggesting. Significant downsizing of the DOE laboratories cannot be achieved simply through greater concentration of missions.

Any plan for greater specialization for the DOE multiprogram laboratories must weigh carefully the important advantages that accrue from having broad capabilities at one institution. (See also the discussion below for question 7.) The multiprogram laboratories grew out of real needs to undertake large, multidisciplinary projects. In contrast, single-program laboratories have been established where a completely concentrated mission was appropriate. DOE's Lab Operating Board faces a complex job in appropriately weighing these considerations with many others in developing its Strategic Laboratory Mission Plan.

3. ***What are ANL's core competencies?***

See pp. 6-10 of the enclosed Argonne *Institutional Plan* for October 1994.

4. ***On page 4 of the Galvin Task Force Report, it is stated that "[w]e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist."***
   a. ***Do you share this Task Force belief, and if not, why not?***
   b. ***If you do concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where are we currently out-of-balance?***

The most efficient division of labor among the national laboratories, industry, and universities is an important issue that deserves careful consideration, especially as major new research areas open up. For such new areas, it is increasingly a question of forming partnerships across the three classes of performer that exploit the strengths of each through mutually complementary roles, not a question of just choosing one performer over the other two.

In considering this division of labor, it is important to recognize the large and growing direct cooperation between the national laboratories and both industry and universities. In recent years, the number of cooperative R&D agreements between the labs and industry -- encouraged by new federal legislation -- has exploded. Also, in FY 1994 approximately 1300 researchers from industry, along with 6800 researchers from universities, used facilities at the national labs for their work. As the Galvin Task Force Report (p. 42) concludes, "the laboratories are now and should remain an important part of the nation's infrastructure, providing cutting-edge scientific instrumentation and operating world-class research facilities."

5. ***On page 19 of the Galvin Task Force report, it is stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences)."***
    a. ***Would you concur with this statement, and if not, why not?***
    b. ***Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?***

The Department acknowledges the importance of enhancing the integration of its applied and fundamental energy R&D programs and has made this objective a primary task of the new Lab Operating Board. We feel that the Department's recognition of the problem and the Department's strategy for addressing the problem are both reasonable. We do not think that reorganization under a single Assistant Secretary for Research and Energy Technologies would be helpful. (It is interesting to note that most large organizations, including private corporations, have problems similar to those of DOE in coordinating their "strategic business units.")

6. ***On page 20 of the Galvin Task Force Report, it is stated that "[t]he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D." Do you share this Task Force belief, and if not, why not?***

We concur that energy efficiency, conservation, renewables, and gas and oil recovery should be among the highest priority research areas of the Department. Current funding levels for these programs may already fully reflect their high-priority status.

We also agree with the Galvin Task Force that the national laboratories should continue to be involved in nuclear fission-related R&D. In fact, this R&D area should also be given the highest priority. Nuclear energy is a vital element of the future energy supply mix for the United States and the world. Current DOE policy supports only R&D on advanced light water reactors. But government support is particularly critical for longer-term, high-risk research on advanced reactors that can enhance safety, improve utilization of uranium resources, reduce waste disposal problems, and lessen risks of nuclear proliferation. We urge a reinvigoration of DOE's advanced reactor program.

7. ***On page 25 of the Galvin Task Force Report, it is stated that "to date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence." Do you concur with this Task Force statement, and if not, why not?***

The choice of where within the laboratory system to allocate R&D program elements is driven first and foremost by the judgment of the DOE program manager as to precisely what capabilities will be needed to execute the program's mission. The best available people and facilities may not all be at one lab, and it may be too costly or infeasible to bring them together. Further, as many DOE program managers will attest, appropriately managed competition can be an effective spur to innovation and research excellence. Thus, we suspect the present situation wherein three laboratories are working to develop different advanced battery technologies is more efficient than attempting to collect all the R&D resources at one location. (The Galvin Task Force Report recognizes the importance of competition among the laboratories; see p. 25.) Balancing these considerations (and many others) in assigning R&D programs to the various multiprogram laboratories is a complex job for individual DOE program offices. Generally, we think the program managers are doing a good job.

8. ***On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas."***
   a. ***Do you concur with this Task Force statement, and if not, why not?***
   b. ***If you do concur, what specific research areas do you believe have suffered a loss of vitality?***

We largely disagree with this assessment. Even programs at the laboratories that are somewhat isolated physically are generally integrated fully into the relevant national R&D communities. In fact, most of the laboratories are geographically near academic and industrial R&D organizations, and laboratory staff interact continually and intensely with their counterparts from all sectors. Only in fields narrowly associated with classified national security work are external interactions significantly curtailed.

It is true that the research culture at a national laboratory tends to be somewhat different from that at other types of research organizations. Involvement in "closely coordinated, multidisciplinary research over an extended period" (as the Galvin Task Force Report describes the national labs' role on p. 41) may lead to greater confidence in the stability of future funding than is typical of a university grant applicant or a researcher at a corporate lab. Also, research efforts at the national laboratories are, by their very scope, often more self-contained than a typical project in the same field at a university. However, linking such real differences to "a loss of vitality in some research areas" seems to us very tenuous. Argonne is always seeking ways to enhance the vitality of its programs, but attempting to change the national laboratory culture does not seem to us to be an important way to achieve that goal.

Committee on Science

Subcommittee on Basic Research
and
Subcommittee on Energy and Environment

Joint Hearing
March 9, 1995

Follow-up Questions Submitted by Mr. Rohrabacker to

Dr. Charles V. Shank
Director
Lawrence Berkeley Laboratory

1. **What is Lawrence Berkeley Laboratory's (LBL's) official mission statement?**

ANSWER: The Lawrence Berkeley Laboratory's fundamental mission is to provide national scientific leadership and technological innovation to support the Department of Energy. LB's mission addresses four distinct goals:

- To perform leading multidisciplinary research in the energy sciences, general sciences and biosciences in a manner that ensures employee and public safety and protection of the environment.

- To develop and operate unique national experimental facilities that are available to qualified investigators.

- To educate and train future generations of scientists and engineers to promote national science and education goals.

- To transfer knowledge and technological innovations and foster productive relationships between LBL research programs, universities, and industry to promote national economic competitiveness.

2. **The Galvin Task Force Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions.**

   Would you concur that the LBL's mission suffers from such a lack of focus?

ANSWER: I would not concur, and believe that the work performed at LBL falls within the definition of our mission statement and are consistent with the mission needs of the Department of Energy and our other sponsors.

3. What are LBL's core competencies?

ANSWER: Lawrence Berkeley Laboratory, through its strategic planning process, has identified seven core competencies and four fundamental capabilities or "foundations". They are:

Core competencies:	Bioscience and biotechnology Particle and photon beams Characterization and synthesis of materials Advanced Technologies for Energy Supply and Energy Efficiency Chemical Dynamics, Catalysis, and Surface Science Advanced Detector Systems Environmental Assessment and Remediation
Foundations:	National Research Facilities Computation and Information Management Engineering Design and Fabrication Technologies

4. On page 4 of the Galvin Task Force Report, it is stated that "(w)e believe that an appropriate division of labor among the national laboratories, industrial research institutions and research universities can be established but does not sufficiently now exist".

a) Do you share this Task Force belief, and if not, why not?

ANSWER: I agree that there needs to be, and that there is, an appropriate division of labor between the three different types of research institutions., but believe that this division is roughly in balance The real challenge, in my mind, is what the national response is to the rapid shrinking of the industrial research sector because of international economic pressures. There is, in my opinion, a growing and important role for both the national laboratories and the research universities in continuing research activities abandoned by the private sector.

b) If you do concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where are we currently out-of-balance?

ANSWER: See above answer.

5. **On page 19 of the Galvin Task Force Report, it stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy and basic energy sciences)."**

a) Would you concur with this statement, and if not, why not?

ANSWER: I concur with the premise that the balance of research support for the more applied energy R & D programs would be would be more rationally calibrated with national needs if their budgeting, and perhaps programmatic, activities were integrated. I do not support including the fundamental R &D activities of the Department in this integration, as I firmly believe it would dramatically limit their scope. The basic research activities of the Department are already integrated through the Office of Energy Research and its programs.

b) Might such integration be easier to achieve if DOE were to eliminate the positions of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g. Assistant Secretary for Research and Energy Technologies)?

ANSWER: The structure of these programs is a challenging question, and one that is under serious consideration by both the Department's restructuring team and the Secretary of Energy Advisory Board's Task Force on Strategic Research and Development. Both of these efforts will be completed in the near future, and I would recommend examining their reports and recommendations before coming to any conclusions.

6. **On page 20 of the Galvin Task Force Report, it is stated that "(t)he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency,**

conservation, renewable energy sources (including photovoltaics, biomass, wind, geothermal, and hydrogen), and more efficient recover of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D."

Do you share this Task Force belief, and if not, why not?

ANSWER: I believe that, along with fusion energy, these are the appropriate energy supply and demand R & D activities that the Department should be undertaking. There is, however, a core set of research activities carried out by the programs within DOE's Office of Energy Research that provide the base of fundamental knowledge that allows these energy options, and their effects, to be better understood and developed. These activities are as important for the long-range energy security of our nation as any of the aforementioned programs.

7. **On page 25 of the Galvin Task Force report, it is stated that "to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."**

Do you concur with this Task Force statement, and if not, why not?

ANSWER: The Department of Energy has historically managed its research programs by taking advantage of unique technical capabilities at each of its laboratories, plus those in academia and the private sector. All of these programs have then been coordinated by the DOE program managers. Some of the programs have defined Centers of Excellence or lead laboratory roles when the centralization of program responsibilities or the size of the research effort demanded such an organization. I believe that it would be a mistake to consolidate all research activities in a limited number of laboratories, but support for such activities should be driven by the quality of the research teams, the size of the necessary activities and whether the research is within the core capabilities of the laboratory.

8. **On page 41 of the Galvin Task Force report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas."**

a) Do you concur with this Task Force statement, and if not, why not?

ANSWER: I strongly disagree with this statement. All of the DOE laboratories have worked in partnership since their inception with other research institutions from around the nation and the world. Working in partnership is, in fact, an increasing trend spurred both by its cost-effectiveness and the growing electronic capabilities to collaborate. I also strong disagree with the "sense of entitlement" comment, since every research dollar that comes into our laboratory has resulted from a competition between DOE laboratories, and other research performers, that we have won because of the unique research capabilities and our core competencies that we bring to the table.

b) If you do concur, what specific research areas do you believe have suffered a loss of vitality?

ANSWER: See above answer.

OAK RIDGE NATIONAL LABORATORY
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FOR THE U. S. DEPARTMENT OF ENERGY

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April 11, 1995

The Honorable Dana Rohrabacher
Chairman, Energy and Environment Subcommittee
Committee on Science
U.S. House of Representatives
Suite 2320 Rayburn House Office Building
Washington, D.C. 20515-6301

Dear Representative Rohrabacher:

Attached are responses to the follow-up questions you requested concerning my testimony at the Joint Subcommittee hearing on March 9, 1995, on *Alternative Futures for the Department of Energy National Laboratories*.

Sincerely,

Alvin W. Trivelpiece

AWT:mah

Attachment

1. What is Oak Ridge National Laboratory's (ORNL's) official mission statement?

The Oak Ridge National Laboratory is a Department of Energy multiprogram laboratory. It is managed for the Department of Energy (DOE) by Martin Marietta Energy Systems, Inc. The mission of the Laboratory is to conduct basic and applied research and development (R&D) to advance the nation's energy resources, environmental quality, scientific knowledge, educational foundations, and economic competitiveness. The Laboratory collaborates with other federal agencies, industry, and universities. It is committed to excellence in all of its activities and will be operated in full compliance with environmental, safety, and health laws and regulations.

The official mission of Oak Ridge National Laboratory appears in our annual Institutional Plan. It is approved by the DOE's Office of Energy Research as part of their annual on-site review of the Institutional Plan.

2. The Galvin Task Force Report, on pages 23-25, makes a number of observations about laboratory missions, including the lack of focus in current missions.

Would you concur that the ORNL's mission suffers from such a lack of focus?

Over the years, there has been some discussion that the missions of the DOE multi-program national laboratories are not unique and, in fact, could be switched from one institution to another without any loss. A similar statement could also be said of universities. While the DOE national laboratories may not unique missions, they each have staff with unique talents that contribute to solving the tough scientific and technical challenges faced by our Nation.

As noted in its mission statement, ORNL is a multiprogram national laboratory of the Department of Energy. Because of ORNL's capabilities, DOE program managers believe it appropriate to fund research activities at ORNL. The wide variety of activities at the DOE national laboratories has its origins in the broad mission focus of the Department of Energy as determined by the Atomic Energy Act and succeeding legislation. Being concerned with energy sources, their use and disposition, and related environmental and health considerations, research needs to be performed on energy sources coming from the ground, so geology and geophysics are of interest. Determining how to increase efficiency and effectiveness requires knowledge of physics and chemistry and engineering. Analysis of safety, and health concerns for humans and the environment requires expertise in biology, medicine, and the ecological sciences.

3. What are ORNL's core competencies?

In preparation for the visit by the Galvin Task Force, ORNL identified four core competencies. They are characterized by the following criteria: investment of at least $100 million, national or world prominence, a high degree of integration, relevance to Laboratory missions, difficulty to reproduce, and demonstrated success. The core competencies are: energy production and end-use technologies; biological and environmental science and technology; advanced materials synthesis, processing, and characterization; and neutron-based science and technology. A brochure discussing these core competencies in greater detail is enclosed.

4. *On page 4 of the Galvin Task Force Report, it is stated that "[w]e believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist."*

   a. *Do you share this Task Force belief, and if not, why not?*

I do not share the belief that an appropriate division of labor does not exist among the DOE national laboratories, universities, and industry. It is true that this division of labor has shifted over the years. In the days following World War II, the cost of scientific equipment was such that a dozen or so universities could receive funding to permit state-of-art-research at an accelerator or a reactor. The cost of scientific research facilities has climbed so that only a few of these facilities that are capable of world-class research now exist nationwide. Many of these facilities are located at the DOE national laboratories. Over the last decade, the funding of industrial research has also declined as corporations have regarded research as a variable overhead expense that can be trimmed. Industrial organizations are looking for paybacks of their research in a much shorter time frame than that of the DOE national laboratories which have emphasized long-term high-risk research.

All of this economic pressures are occurring at the same that more emphasis is being on interactions with both the private sector and academia. In scientific research, ORNL has expanded its contacts and collaborations. About 70% of ORNL's publications in refereed scientific journals are co-authored with individuals from outside of ORNL. Similarly, with the passage of the Stevenson-Wydler Act, the Federal Technology Transfer Act of 1986, and the National Competitiveness Technology Transfer Act of 1989, interactions with the industrial sector have grown tremendously. Now over 4000 guest researchers annually stay two weeks or longer at ORNL. More than a third of these are from industry. This trend has been growing for many years and the number of full-time equivalents of these guests now equal the regular ORNL research staff.

   b. *If you do concur with this Task Force belief, what, in your view, is "an appropriate division of labor" and where we are currently out-of-balance?*

See answer to question 4. a.

5. *On page 19 of the Galvin Task Force Report, it is stated that "one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences)."*

   a. *Would you concur with this statement, and if not, why not?*

The program managers within the Department of Energy prepare the annual program plans and proposed budgets are submitted to Congress for authorization and appropriations based on these plans. Periodically there are initiatives that involve several programs or agencies. For instance, the concept of sustainable development involves activities funded through government agencies such as the Environmental Protection Agency, and Departments of Agriculture, Commerce, and Energy. I believe DOE would sponsor roughly 60% of the research attributed to this concept, and constituent elements are found in many programs (energy efficiency, fossil, etc.). These broad interagency programs are coordinated through the Office of Science and Technology

Policy. These programs, while under different offices at DOE, are integrated at the national laboratories.

A bigger challenge faced by the national laboratories is the extensive bureaucracy involved managing individual projects that over the last several years have become more numerous and yet total about the same dollar value. A single check does not come to the ORNL Laboratory Director for me to determine which projects to fund and at what level. An analogy might be that instead of coming in a tanker truck to the ORNL front door, the funds arrive in hundreds of little tea cups earmarked to specific projects. Just for its DOE programs, ORNL submits over 300,000 budget pages for 113 different DOE offices for less than 600 Field Work Proposals. The number of budget control points has dramatically increased and must be reported on monthly. All of these requirements mean less funds are available for the research and more funds are being sapped by nonproductive administrative rules and procedures.

b. Might such integration be easier to achieve if DOE were to eliminate the positions of Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, the Director of the Office of Energy Research, and the Office of Nuclear Energy and combine these responsibilities under one Assistant Secretary position (e.g., Assistant Secretary for Research and Energy Technologies)?

As funding priorities change, these are reporting decisions that need to be examined periodically. The Department of Energy is currently involved in an effort of Strategic Alignment of the Department's functions with the Department's Strategic Plan. The Secretary of Energy Advisory Board Task Force on Strategic Energy Research and Development (Yergin Task Force) is assessing the DOE's energy R&D programs. The goal of better coordination of applied energy research would be an appropriate subject to be included in such evaluations.

The title of the Office of Energy Research does not reflect its role in managing the fundamental sciences in the Department of Energy. This Office has responsibility for research in physics, chemistry, materials science, biology, and environmental science. It is the Program Secretarial Officer for management of the five multi-program and the majority of the single program laboratories. There is statutory responsibility under the Atomic Energy Act for the Director to be the Secretary of Energy's science advisor. Combining the basic research function of the Office of Energy Research with more applied programs has little to offer toward gains in efficiency or effectiveness and appears to be detrimental to university researchers who are the primary beneficiaries of the Department's large and unique user facilities, such as accelerators and reactors.

6. On page 20 of the Galvin Task Force Report, it is stated that "[t]he Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources (including photovoltaic, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D."

Do you share this Task Force belief, and if not, why not?

Our nation has great energy needs and the national laboratories can contribute to establishment of a broad portfolio of options for the energy future. The areas listed in the question are certainly important to development of this portfolio. However, there needs to be a balance between the applied R&D areas and the more basic or fundamental research. Section V of the Galvin Task Force Report, entitled "The Science-Engineering Role," indicates that scientific research is needed to provide the underpinnings for the applied research. It is one thing to develop new materials and another to understand why materials behave in a particular way. Both basic and applied research are important, and there is a need to perform both at the national laboratories.

7. *On page 25 of the Galvin Task Force Report, it is stated that "to date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."*

Do you concur with this Task Force statement, and if not, why not?

If a similar statement was made about the resources of the academic community, there would be a strong disagreement. Why don't all of the university research programs in a particular field be funded at a particular university? The answer is similar to why this is not done for the national laboratories: to the research sponsor, individual laboratories look attractive for one project and not for another. This is typically because of their facilities and expertise of their research staff. The decision to fund work at one laboratory and not at another is made by the DOE program manager who is interested in getting the finest work performed for his research dollar. The term "spreading the wealth" implies there is a process to somehow equally divide research funding. Scientists at the DOE national laboratories are similar to scientists elsewhere, they want to be at the leading edge of their research field. No one wants to report that he too has discovered the "kumquat" effect.

Each national laboratory has Centers of Excellence built around its core competencies. These Centers have developed over time as the staff and facilities have successfully met the needs of their DOE program managers. The core competencies of ORNL are not new. They have developed through conscious efforts of ORNL to focus in particular research directions and of recognition by DOE program managers that high quality research and development is performed here.

8. *On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas"/*

   a. *Do you concur with this Task Force statement, and if not, why not?*

Until the advent of technology transfer legislation, many of the researchers of the non-defense national laboratories were not encouraged to collaborate with researchers from other institutions. All of this has now changed. Over 4000 scientists and engineers from other institutions now spend two weeks or longer at ORNL annually. This number has grown steadily over the past decade to such an extent that they now approach, in terms of full-time equivalents, the number of permanent research staff . All of the DOE national laboratories serve as regional, national, and international R&D centers, with their user facilities serving as a magnet for attracting researchers.

Several peer evaluations have been performed by the DOE Office of Energy Research of programs they support. The research performed by the national laboratories is evaluated as highly as the research performed by universities. The DOE program managers annually make decisions on which programs to fund and which not to fund. If some researchers believe they have an entitlement to receive funds, the DOE program manager is interested in funding the highest quality work that meets his research agenda.

b. If you do concur, what specific research areas do you believe have suffered a loss of vitality?

See answer to question 8.a.

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March 14, 1995

The Honorable Steven Schiff
Chairman, Subcommittee on Basic Research
2320 Rayburn House Office Building
U.S. House of Representatives
Washington, D.C. 20515

Dear Steve:

I am writing to request that the enclosed material be included as part of the record from the March 9, joint subcommittee hearing on the Galvin Report. The attached material contains two additional questions that I was unable to ask Dr. Al Trivelpiece, the Director of Oak Ridge National Lab.

Thanks for your assistance.

Warmest regards,

Zach Wamp

Zach Wamp
Member of Congress

ZW:js

Mr. Wamp: Dr. Trivelpiece, what is your view of the idea of a base closing commission approach to dealing with the Department of Energy's national laboratories?

Dr. Trivelpiece: It is tempting to want to use a simple tool such as a base closing commission approach to avoid the political problems that occur when it becomes necessary to consider how such facilities are to be selected for shut down. There is always a problem with the fact that many people near a military facility have built their community around it and are dependent on it for the income that comes from its presence. Where the parallel with a national laboratory breaks down is in part in the nature of the function that a laboratory provides beyond the income stream to the community for the function it performs. This function is the research and development work that is done as part of programs that are funded by the Congress and the Administration. The laboratories are not funded directly as entities. As a laboratory director I do not get funds that I am then free to assign to various programs. I am obligated to follow the guidance that is given me by the Department with respect to the funding of particular activities. I don't know how to deal with an instruction to reduce the budget of the Oak Ridge National Laboratory by say 10%. However, if the Administration and the Congress agree to reduce or eliminate a particular program, and the funds for that program are not given to the lab, then I know how to stop work on that program and either discharge the employees working on it or find other work for them to do. This was what I had to do when the New Production Reactor program was terminated. The reduction for ORNL was about $15 million. We were smaller by that amount last year. If there are programs that the Administration and the Congress wish to terminate that reduce funding at a particular lab, then the labs will be reduced and perhaps be eliminated. I believe that the Congress should focus on the programs that it wishes to eliminate, and those programs that it wishes to continue. If the DOE national labs can not write proposal that are competitive, then they will not survive. In this era of more open national and global competition, it seems unfair to say that we shouldn't be allowed to compete for a particular research activity. After all, we just might be the best performer for a particular program that the nation wishes to fund. This does not address the question of whether we could do the same scope of work at a reduced level of programmatic funding. That is, could the indirect or overhead costs be reduced. The answer is yes. However, as the lab director, I don't have full control over the majority of the overhead costs. They come about as a result of rules, regulations, and the audits that are performed to ensure that we carry them out. The Galvin Task Force report identifies some of these problems, and suggests that improvements could be made if the changes outlined in Appendix B of the report could be accomplished.

Mr. Wamp: Dr. Trivelpiece, would you give us your views on the need for the Department of Energy labs to focus their missions on a few activities and only work on these activities as centers of excellence.

Dr. Trivelpiece: This is not an easy question to answer. There is always a concern over the fact that there is apparent duplication of activities among the national labs. I have always found the argument to be troubling because it is based on perception and not reality. If there were duplication, it would be because the Department of Energy was funding duplicative activities, which I don't believe they do. I am not aware of any of the Department's program managers intentionally funding two labs or universities to do the same work at the same time. And even if there was the same general description of the work in the grant or contract financial plan, no two scientists or engineers would ever want to be doing something that merely duplicates what someone else has already done. Occasionally, as was the case with the so called "Cold Fusion" work, there was a great deal of work done to reproduce the "results" without success. This is a normal part of scientific inquiry and if the results had been confirmed, it would have led to a great deal of new work that would have sorted itself out quickly so that there would have been little or no duplication. In the case of the discovery of high temperature superconductivity, there was a great flurry of effort to reproduce the reported results. This was very productive and led very quickly to many advances in the knowledge about these new materials. But, in any case, no scientist or engineer wants to get up at a meeting and say, "We too have discovered that..." So, I don't believe that the charge of excessive duplication is correct and, therefore, do not believe that it should be used as a club to say that we need to focus our missions more tightly and not work in certain areas of research and development. This discussion on missions has gained a momentum that is troubling. For instance, suppose that the same approach were used to examine universities. Then, it might be that Harvard would focus on History and English , but not have Engineering or Physics. The University of California would have to change its mission to focus on Chemistry, while the University of Texas would do only Engineering. The multiprogram national labs are like universities. They each need to have the equivalent of a Physics, Chemistry, Engineering and English department in order to function as effective institutions that can do interdisciplinary work better that any other institution. Just because two universities have Physics departments does not mean that each faculty member in each institution is doing exactly the same research and teaching.

At the recent ceremony to award the Fermi Prizes, which you attended, the winners--Dr. Lianne Russell of Oak Ridge National Lab and Professor Freeman Dyson of the Institute of Advanced Studies--had a chance to make comments. Professor Dyson's comments focused in part on the fact that the prize that he and Dr. Russell were being given was a recognition of the wonderful institutions at which they worked for almost all of their professional careers. That is, these institutions had given them the freedom to pursue their research interests. And further, it was this freedom that led each of them to have produced the excellent work for which they were being honored. I can't help but wonder that in our drive to "focus" and "direct" missions and research that we might be denying our nation some future Fermi or Novel Prize winner, and the benefits of the discoveries or work such a recognition presents, in the process. Maybe the effort to focus attention on missions for our national labs should be changed to focus attention on baseball. This would lead to a situation where baseball teams will have to focus their efforts such that one team can only strengthen its pitcher, another team the short stop, and so on.

The mission of the labs should be what the country wants done and is willing to fund. Either the labs are the best equipped to carry out that work or they are not. The focus should be on the programs that the country regards as essential, not on who should be doing the work.

Responses of John Peoples to the questions posed by Congressmen Schiff and Rohrabacher in their letter of March 16, 1995

Question 1:

On page 41 of the Galvin Task Force Report, it is stated that "the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas"?

a. Do you concur with this Task Force statement, and if not, why not?

b. If you do concur, what specific research areas do you believe have suffered a loss of vitality?

I cannot concur with the statement of the Galvin Task Force Report that "the research culture at many laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas," if the phrase "many laboratories" is taken to include the dedicated program laboratories. I note that the Galvin Report did not examine the dedicated program laboratories, such as Fermilab and the Stanford Linear Accelerator Center (SLAC). The Report's main conclusion, that the [multiprogram] laboratories do not have well defined missions, does not apply to the dedicated program laboratories whose missions are acknowledged to be very well defined. To give an informed answer to your question, I must restrict myself to what I know, the scientific field of high energy physics. My comments are particularly applicable to Fermilab and SLAC, the two Department of Energy dedicated program laboratories engaged in high energy physics.

The research culture in high-energy laboratories is neither physically nor intellectually isolated because of the tight interconnections among the universities and laboratories engaged in high-energy physics. The connections extend to other fields of physics, as well, through physics departments of these same universities. These tight interconnections create an extremely lively and competitive culture; only the best survive and flourish. The accelerators and detectors that are essential for continued progress in the field of high-energy physics are proposed, designed, built, and used in a partnership between laboratory staff and university faculty and their students. The Department's predecessor, the Atomic Energy Commission, created these laboratories—the last built almost thirty years ago—in response to a recognition by the universities that the cost and scale of high-energy physics research facilities dictated the operation of just a few facilities, shared by all.

Let me describe how the system works at Fermilab. Fermilab is operated by Universities Research Association, a consortium of 80 universities with physics research programs. The universities control the selection of members of the Board of Overseers, the board that monitors the management of Fermilab, including the support that Fermilab provides the university groups working at Fermilab. The Board also reviews and approves submission of major projects to the Department of Energy, such as the Main Injector. Typically the Board consists of university research vice presidents, industry research vice presidents, and some active senior physicists. A separate body, the Fermilab Physics Advisory Committee, makes the major recommendations to the Director on the selection of experiments that will be carried out at Fermilab—this includes which areas and proposals to pursue. The PAC consists of high energy physicists from universities and high-energy laboratories; only one is currently a Fermilab staff member. The peer review of the quality of the Fermilab research program by the PAC and the physics community is continuous. The weak and inappropriate are rather quickly weeded out. Through these mechanisms and through the Department of Energy's program office Fermilab's program and its relationship with the university community is constantly examined. The programmatic oversight of the Stanford Linear Accelerator is very similar.

In no sense is research in high-energy physics considered an entitlement, as for example, in the case of agricultural subsidies. It is no secret that some farmers are paid not to grow crops; I assure you that no high-energy physicists are paid not to search for an understanding of the fundamental properties of matter. The strong desire of high-energy physicists to continue to pursue their search in spite of the budget deficit should not be interpreted as a misplaced sense of entitlement. Research in a fundamental science such as high energy physics is a long-term investment, not an entitlement. Scientists working in high-energy physics recognize that Congress and the Administration have the responsibility of determining the level of investment that the nation makes in high-energy physics, and that they must balance a commitment to that investment with many other urgent claims on the nation's tax dollars.

I cannot deny that many of the people who work in high-energy physics are disappointed with the prospects for the future of the field in the U. S. The cancellation of the SSC was an immense disappointment to many of these people, for they feared it would be followed by a very rapid decline of high-energy physics in the U. S. In some quarters of Congress, there is talk of a sharp reduction in funding for high-energy physics. Such a reduction, if it came, would mostly affect today's Ph.D. students and the researchers at the laboratories and universities who are not tenured faculty members. Some of these students would be unable to complete their Ph.D.s after investing years of their lives. The researchers would have to leave the field and make career changes and in some instances, at an awkward age. They are apprehensive, as well as disappointed.

Some in the public, some scientists in other fields, and some members of Congress view their disappointment as an expression of entitlement; but that is an unfair characterization of their dilemma.

The field has responded to the new reality of a declining budget, at least as the situation existed a year ago. The FY1996 budget request for high-energy physics is now a little more than half of the enacted appropriation for FY1994. The Department of Energy, acting on advice provided by its High Energy Physics Advisory Panel (HEPAP), has developed a plan to maintain the vitality of the U. S. high energy physics program and keep the U. S. among the world leaders in this discipline for the next decade. They propose to do this within the resources of the current budget request. Should the debate on the deficit result in further reductions in funding, then the Department and the field will respond. If further reductions in program funding occur, a vital research program can be sustained only if high-energy physics ceases to be a mission at some of the Department's laboratories; and if some university research grants are terminated. In short the program would have to be reduced to keep the parts that remain healthy. This would best be done by the approach that the Department has used in the past, by asking HEPAP to provide recommendations on the scope of the best program that a predetermined annual budget can provide. In the past this has required difficult choices. I am confident that it could be done again, unless the funding reductions are so deep that a vital research program cannot be sustained. I believe that a great nation such as the United States should strive to be among the world leaders of high-energy physics.

Question 2:

A number of observers have proposed the transfer of DOE's High Energy Physics Program to the National Science Foundation. What, do you believe, are the pros and cons of such a transfer proposal?

You have asked me to discuss the pros and cons of a transfer of DOE's High Energy Physics program to the National Science Foundation. My comments here assume that:

- The budget for the high energy physics program would not change as a consequence of the transfer.
- The legislation that defines the National Science Foundation would be amended so that laboratories like Fermilab and SLAC could operate the facilities and their laboratories as they do today.

The case for moving the Department of Energy's high-energy physics program to the National Science Foundation rests on the notion that the science of high-energy physics and the technologies required to advance it do not appear to have much in common with the science and technology needed for the conversion of fossil fuels into energy or the exploitation of existing renewable sources of energy. Some believe that the agency responsible for high-energy physics should have fundamental science as its primary goal, because such an agency would get more high-energy physics research for every dollar invested. They also believe that DOE cannot focus on fundamental science in the same way as NSF, because of DOE's other missions. My experience does not bear out that view. Let me explain my views.

At first glance, the research in the physical sciences supported by the Department of Energy, largely through its management of large user facilities like particle accelerators and neutron sources, is not directly related to its fossil and renewable energy programs. A similar observation could be made, for example, about the relevance of the science needed to fulfill the Department's responsibilities for its science-based stewardship of the nuclear weapons stockpile and the science needed to advance the fossil and renewable energy programs. The science needed to develop the technologies that could allow the Department to carry out the environmental restoration of the now-idle nuclear weapons production facilities in a more cost effective manner is also tenuously connected to the science that underlies the needs of its fossil and renewable energy program. Nevertheless, the sum of the Department's science programs, including those for which science is the product, make a coherent whole. The system of the Department's weapons laboratories, multiprogram laboratories, and dedicated program laboratories provides more than the sum of its individual parts.

The Department's national security, environmental clean-up, and science missions are all inherently governmental activities. The Federal government has the sole responsibility to carry out these missions; they are not appropriate, or possible, for the private sector. It is worth noting that these three missions have in common the underlying need to advance the understanding of the physical sciences. High-energy physics is an important part of the Department's research program in the physical sciences. The Department, because of its historical connection to the Manhattan Project, has built and operates the nation's large scientific user facilities, such as accelerators and neutron sources, that are essential for research in the physical sciences. This scientific function of operating and exploiting large user facilities has become a mission in its own right.

In contrast, the development of energy sources is not an inherent function of the federal government; supplying energy has traditionally been the responsibility of the private sector. It is appropriate for the federal government to support the development of new energy sources when the lead time to develop the technology presents too great a risk for private enterprise to undertake. However, the Department of Energy should undertake such a risk only if these sources can be brought closer to the market through intensive research in the physical sciences. It should not be done simply because it is risky.

It can be argued that the Department programs in the physical sciences would not be damaged if laboratories like Fermilab and SLAC were moved to the National Science Foundation and if multiprogram laboratories such as Argonne ceased to engage in high-energy physics research. It is possible that high-energy physics would benefit from such a change by throwing off the yoke of excessively prescriptive oversight. I believe, however, that the same beneficial result can be achieved by allowing the Department of Energy to finish its own process of reducing excessive oversight. In the last year, many changes have been proposed to allow the Department to reduce its costs. These efforts deserve a trial. I conclude that the case for transferring the high energy program is not very compelling.

The main argument against moving the high-energy program to NSF is that it is the start of the dismantling of the system of Department of Energy laboratories. Another argument advanced for moving the high-energy physics program to NSF is the difficulty of doing it. It might not be too difficult to move Fermilab and SLAC into the National Science Foundation. Everything that these two laboratories do is also done by the National Science Foundation, on a vastly smaller scale. However, if high-energy research were to continue at Argonne, Brookhaven, Lawrence Berkeley Laboratory, and Los Alamos, the transfer of the high-energy physics programs to NSF would probably create significant bureaucratic complexity for NSF, since these laboratories are multiprogram laboratories with programs that are not appropriate for NSF.

It is doubtful that the transfer of this program could be done quickly and it would disrupt the research in high-energy physics. There are no obvious easy and significant cost savings aside from program reductions, which reduce the vitality of the field, and the presumed elimination of unnecessary oversight.

On balance, I believe that the transfer of the high-energy program to NSF would not solve the problems that the field of high energy physics would have to address in a future characterized by declining funding for fundamental science. It would not improve the focus of the remaining Department of Energy laboratories. I believe that it would make them poorer. If further reductions are called for, the Department of Energy is better equipped to propose to Congress how to make them, and has the political will to do so.

Response to Followup Questions Submitted by Representative Dana Rohrabacher

to

Burton Richter, Director
Stanford Linear Accelerator Center

June 26, 1995

Question One

The question asks about the appropriate division of labor among the national laboratories, industrial research institutions, and research universities.

Response to Question One

I do not share the Task Force belief with respect to the DOE science laboratories that build, operate and facilitate the use of large-scale user facilities. At SLAC our complex of accelerators are used by approximately 1850 scientists (January 1995 census). About 85% of these users are non-laboratory staff coming from research universities, industry, and other laboratories. With respect to my own laboratory and user facilities at other laboratories, I believe the present balance is appropriate.

Question Two

This question refers to the Galvin Task Force report recommendation that the DOE achieve greater integration of its various applied and fundamental energy R&D programs.

Response to Question Two

The coherence of the DOE's energy technology programs would probably be improved if the offices of the Assistant Secretary for Energy Efficiency and Renewable Energy, the Assistant Secretary for Fossil Energy, and the Office of Nuclear Energy were combined under one Assistant Secretary for Energy Technology. The Director of Energy Research in the DOE runs a program that is much broader than Energy Technology and hence I do not believe that it would be appropriate to combine this office with the new Office of Energy Technology.

Question Three

This question refers to the Galvin Task Forces statement on the highest priority research areas in the energy field.

Response to Question Three

This is not my areas of expertise and I defer to the panel on this matter.

Question Four

This question refers to the Task Forces statement (page 25) that "to date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence."

Response to Question Four

I believe this statement is exaggerated. The multiprogram laboratories do now have different areas of expertise., though one might not know it from reading the mission statements of the various laboratories. These mission statement clearly need a tune-up, but it will always be true that multiprogram laboratories, which are multi-disciplinary by nature, will each have to have broad expertise in many areas in science and technology though their programs may concentrate on a more restricted set.

Question Five

Already answered.

Question Six

This question refers to statements made during budget hearings in February that DOE personnel could be reduced by a third to a half without harming mission performance.

Response to Question Six

DOE is certainly over staffed at its headquarters and at its field offices, particularly in the administration and environment, safety and health areas. Exactly how big a cut could be taken without harming mission performance requires detailed analysis, and without that analysis I cannot give a precise figure.

Question Seven

If the DOE management layers were reduced, could SLAC function more efficiently, and, if so, how much money could be saved?

Response to Question Seven

The number of DOE management layers is only part of the problem. The main generator of operational inefficiency is the unwillingness of DOE (and of other government agencies) to allow its contractors to operate using best management practices of the private sector. Only by reducing micromanagement and requirements that contractors generate much useless paper can costs be reduced. SLAC is a program-dedicated laboratory and so suffers less from these problems than the multi-program laboratories. We believe that if allowed to operate in an efficient fashion, we could reduce our costs by about 5% of our budget.

Question Eight

What specific DOE management practices would you alter to improve the efficiency of your laboratory?

Response to Question Eight

DOE should stop telling the laboratories how to do things and should, instead, specify the work to be done and monitor the performance of the work. The Department of Energy Acquisition Regulations should be eliminated in their entirety for they add nothing to the Federal Acquisition Regulations other than useless paperwork. DOE should adopt regulations generated by other federal agencies (OSHA, DOT, etc.) where such regulations exist and should develop its own only in specialized areas (nuclear weapons production, for example) where there is no expertise outside of DOE.

Question Nine

Out of every dollar appropriated to your laboratory, what is your best estimate of the fraction of that dollar that actually gets to the scientist doing the research?

Response to Question Nine

SLAC's mission is the construction, operation, maintenance and development of large-scale facilities for use by the broad scientific community. With respect to this laboratory, I interpret the question to mean what fraction of the SLAC funding actually gets to the mission. Our base program funding totals $136 million in FY1995 (this excludes the $44 million for the B-Factory line item construction project). Of this amount 6% goes general and administrative expenses, 4% goes to laboratory-wide environment, safety and health programs, 6% goes for site support (utilities, building maintenance, etc.), and the remaining 84% goes to mission support.

Question Ten

Already answered.

APPENDIX III

Prepared by
Robert Galvin
Task Force Chairman

Summary of Recommendations from the Task Force

Overview

Page 1

1. The energy agenda requires, federal, senior cognizance.
2. Energy is central to the vitality of the country.

Page 2

3. Require...strong federal financial support.
4. A need for focus.
5. The laboratories must be free to renew and press the frontiers of their energy agenda.

because

Page 3

6. We must be in quest of that we do not know in every field of science.
7. The laboratories research role is essential for continuing leadership by the United States.

Page 4

8. These activities should be carefully managed, and should not be a license to move into areas of science and technology which are already being addressed...[elsewhere]
9. An appropriate division of labor among the Laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist.

Page 5

10. The existing budget exceeds that required.
11. It is unrealistic to claim "new missions."

Page 6

12. Energy R&D at the laboratories should be coordinated with the private sector.
13. Guided by technology roadmaps.

Page 7

14. Particular projects should be cost shared by the industrial sector.

Page 8

15. The current system of governance of these laboratories is broken and must be replaced with a bold alternative.

Page 9

16. A new paradigm of governance...must not be used as a political pretext to dismantle [the] laboratories.
17. The governance must ensure long term, fundamental research...not "job shops" for industry.
18. The new system must not be burdened by creeping micromanagement, non-productive oversight, and institutional fragmentation.
19. A balance must be achieved between continuing oversight and environmental damage...and excessive burdens and inherited environmental responsibilities.

Page 10

20. The Laboratory system is oversized
21. Could be downsized...through the elimination of functions and redundancies.
22. The Laboratories should work more as a system.
23. The Task Force does not make any recommendation about closure of laboratories.

The National Security Role

Page 12

24. The [national security mission] will require new types of management, personnel, and operation closer to industry's.
25. The weapons laboratories need the capability to respond both to implement START more quickly, or to return inactivated weapons to service.

Page 14

26. Rewards for high performers [should be provided].
27. Weed...out weaker performers.
28. Engender in the research and engineering staff a sense of achievement, based on personal responsibility and personal accountability [vis a vis new Governance].
29. Resize nuclear weapons laboratories over time to match DOD requirements.

30. The Task force believes LLNL should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter proliferation, intelligence support, and verification to provide independent review for several years while alternative approaches to peer review are developed.
31. LLNL [should] transfer direct stockpile support to other weapons laboratories as the requirements of science based stockpile stewardship, support of the DOD nuclear posture, and the status of test bans allow.

Page 15

32. These [weapons laboratories should] be managed in as open and collaborative a fashion as national security constraints will permit.
33. Continue funding the Dual-Axis Radiological Hydrodynamic Test (DARHT) facility.
34. Continue the Los Alamos Scattering Experiment/Los Alamos Meson Physics Facility (LANCE/LAMPF).
35. Continue advanced computing, including computing through workstation networks.
36. Proceed with the National Ignition Facility (NIF)...

Page 16

37. Non-nuclear defense research activities (should) continue at the weapons laboratories....
38. The capability-based deterrence should be based on Pantex, Los Alamos National Laboratories, and Sandia National Laboratories.
39. Continue R&D in accelerator-based production of tritium.

Page 17

40. The Task Force sees no compelling reason for DOD to manage the national security activities at the weapons laboratories.

[Pages 17 and 18 contain summary recommendations including recommendations previously stated in pages 12 through 16. They are not repeated here.]

The Energy, Environment, and Related Sciences and Engineering Role

Page 20

41. The Task Force believes the energy mission...deserves greater attention by the Laboratories, including working with the private sector.
42. The department needs a framework for rationalizing the management of energy supply and conservation technologies in terms of a strategic portfolio of research and development projects. (Better integration)
43. The highest priority research areas should be energy efficiency, conservation, renewable energy sources...and efficient recovery of gas and oil resources.
44. Continue to be involved in nuclear fission related R&D.

Page 21

45. A consensus must be developed among potentially competing technologies
46. Be careful to ensure that the energy R&D program is not captured or dominated by short-term interests.

Page 23

47. The laboratories should contribute to the integration of the development of the field of industrial ecology.
48. Establish an Industrial Ecology Advisory Board.

Page 24

49. Go further in developing mission assignments for the laboratories.

Page 25

50. Establish "virtual laboratories" via computer networks and lead laboratory assignments.

Page 26

51. Establish Centers of Excellence within the laboratory system.

The Environmental Clean Up Role

Page 34

52. Enhanced institutional connections will be required with other Federal bodies re the remediation program.

Page 35

53. Consider reducing the cost-recovery fees levied on all "Work for Others."

Page 36

54. Sustained improvements in DOE management and leadership are needed.
55. A comprehensive remedy to the EM program can only be achieved by a substantial commitment and high priority.
56. Establish an "Environmental Advisory Board (EAB).
57. The national laboratories together have a critical role to play, larger than at present, in performing high-quality science and engineering for the program.

Page 37

58. Make the national laboratories available to the entire government system as a powerful environmental technical resource.
59. Renegotiate the unrealistic or unfeasible elements of the cleanup compliance agreements that it has made with State and other entities.
60. More comprehensive involvement by members of the affected public in decision making should be engaged.
61. The bulk of the EM environment challenges, although presenting no immediate threats to public health or safety, still should be addressed with a heightened sense of urgency.

The Science Engineering Role

Page 42

62. Move to strengthen efforts in fundamental science and engineering, both at the laboratories and in universities.
63. Ensure a proper balance between the universities and laboratories.

Page 43

64. Support for operating and maintaining large facilities should be budgeted separately from programs.
65. Achieve better integration of basic research, technology development programs, and their applications, particularly in the area of environmental remediation.
66. Basic research at the laboratories should be more fully integrated into the national and international research community.

The Economic Role

Page 51

67. The government-funded technology transfer/industrial competitiveness activities should be focused on industries within the DOE's primary missions.
68. Laboratory directors should have flexibility to initiate or to approve new technical projects at the periphery of current laboratory activities.
69. Competitive selection and more rigorous technical and merit review by external experts should be applied to the Department's CRADA activities.

The Governance and Organization Issue

Page 54

70. We must begin to evolve the development and implementation of a new modus operandi of Federal support, based on a private sector style "corporatized" laboratory organization.

Page 55

71. The not-for-profit corporation(s) will be governed by a Board of Trustees of scientists and executives appointed by the President.

Page 56

72. This Board will select the officers.
73. Each lab would have a trustee advisory board elected by the parent board.

74. Initial funding will be in the form of Congressional line items in the DOE budget in each of the mission areas.
75. DOE will be the sponsor.
76. Fund for multiple years with a decline be built in over a five year period.
77. Allocation of these funds will be made by the corporation. The corporation will deal with traditional agencies for which work is done. Micromanaging or "earmarking" of these allocations should not be made by the Congress or the Department.
78. The corporation and laboratories will be subject to normal control of those agencies of the state and federal government that normally have authority over United States corporations.
79. Allocation to specific projects would be the responsibility of the DOE, with no earmarking from Congress beyond quantifying the amount of money given to each broad block.
80. DOE will be a customer, not "manager."

Page 58

81. Find ways of engaging cooperatively with foreign sources of funds.
82. Liberally use technology roadmaps.

Page 59

83. Liberalize the "design and manufacture only in America" policy.
84. The presently overused metric of "jobs expected to be produced from a CRADA" should be discouraged.

Page 60

85. We call for a true Quality program.
86. There should be a gradual reinvestment by the federal government in repairing research laboratories, and upgrading research instrumentation.
87. Once that [repair of facilities] has been achieved, the responsibility should be turned over to the laboratories.

[Pages 63-66 give a brief summary of many recommendations in the report. They are not restated here.]

Appendix B: If GOCO System is Obliged

P. A-7

88. Base DOE Oversight on laboratories' Performance.
89. Replace compliance-based directives with simple, well-defined performance measures.
90. Eliminate DOE approval of labs' internal procedure documents.
91. Eliminate DOE approval of individual transactions [e.g., in procurement and compensation].
92. Base audits and appraisals on serious risk.
93. Eliminate duplication of audits, appraisals, and reviews.
94. Reward success with decreased oversight.
95. Operate labs according to industry-wide regulatory standards.
96. Eliminate DOE self-regulation.
97. Shift regulatory oversight and inspection functions to responsible federal agency.
98. Eliminate these functions in DOE and reallocate resources.
99. Consolidate roles of DOE oversight offices.
100. Consolidate fragmented headquarters safety roles and responsibilities.
101. Reduce vertical layering of responsibilities for general lab oversight.
102. Delegate oversight to one contracting office per lab, with a well-defined, limited scope of authority.
103. Consolidate or eliminate field offices, at least.
104. Apply rational, consistent business management principles.
105. Institute a multiyear budget process, for both authorization and appropriation.
106. Standardize DOE's budgeting and financial reporting requirements across program offices.

P. A-8

107. Cross-cut budgeting should be examined for appropriateness.
108. Empower labs to locally determine "color of money," except for Congressional mandates.
109. Manage lab infrastructure in a responsible fashion.
110. Re-establish a strong, well-defined landlord function, with one landlord per lab.
111. Consolidate funding sources for infrastructure maintenance and improvement with each lab's DOE landlord.

112. Initiate a multiyear "get well" program for labs' infrastructures.
113. Challenge labs to reduce costs.
114. Allow the quality management programs to become fully applied without outside interference.
115. Strengthen overhead-control efforts.
116. Outsource work based on good business practice for each site.
117. Reengineer administrative processes to fully exploit benefits of modern information systems.
118. Simplify CRADAs much more.

Alternative Futures
for the
Department of Energy
National Laboratories

Prepared by the

Secretary Of Energy Advisory Board

Task Force on Alternative Futures for the
Department of Energy National Laboratories

February 1995

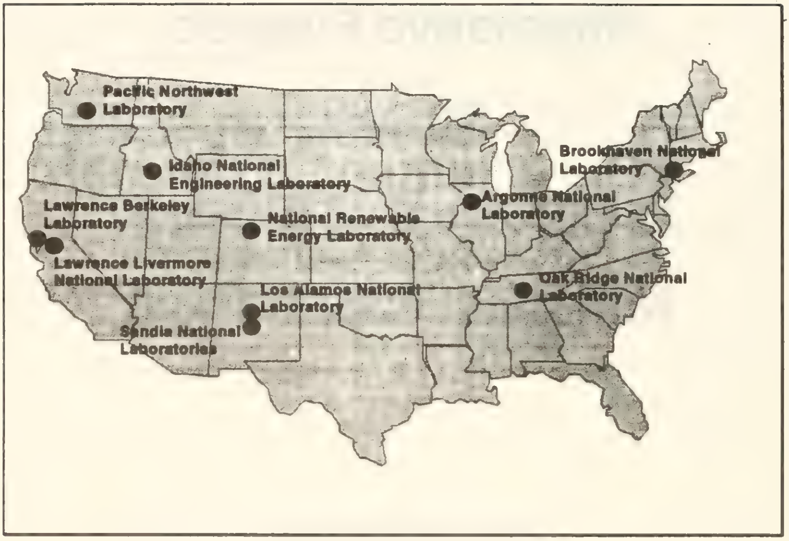
Pacific Northwest Laboratory
Idaho National Engineering Laboratory
Lawrence Berkeley Laboratory
Lawrence Livermore National Laboratory
National Renewable Energy Laboratory
Los Alamos National Laboratory
Sandia National Laboratories
Argonne National Laboratory
Brookhaven National Laboratory
Oak Ridge National Laboratory

Figure 1. Department of Energy National Laboratories Under Consideration by the Task Force

A Reader's Guide to the Report

This report contain many suggestions, the subtleties and significance of which require the reading of all of the necessarily long text. However, the underlined phrases and sentences throughout the document provide a useful scan and outline of the content as a guide to key subject material and the surrounding location in the text that amplify that meaning.

Task Force on Alternative Futures for the DOE National Laboratories

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I. OVERVIEW 1
  A. Introduction 1
  B. Missions of the National Laboratories 4
  C. Laboratory Governance 7
  D. Configuration of the Laboratories 10

II. THE NATIONAL SECURITY ROLE 11
  A. Introduction and Background 11
  B. Main Findings and Recommendations 12
  C. Summary of Recommendations 17

III. THE ENERGY, ENVIRONMENT, AND RELATED SCIENCES AND ENGINEERING ROLE 19
  A. Main Findings 19
  B. Recommendations 25

IV. THE ENVIRONMENTAL CLEANUP ROLE 27
  A. Introduction 27
  B. Background 27
  C. Main Findings 28
  D. Disconnects 30
  E. The Future 33
  F. Concluding Remarks 35
  G. Recommendations 36

V. THE SCIENCE-ENGINEERING ROLE 39
  A. Main Findings 39
  B. Recommendations 42

VI. THE ECONOMIC ROLE 45
  A. Main Findings 45
  B. Recommendations 51

VII. THE GOVERNANCE AND ORGANIZATION ISSUE 53
  A. Introduction 53
  B. The Need to De-Federalize 55
  C. Other Subjects 58
  D. Recommendation 61

VIII. SUMMARY OF RECOMMENDATIONS 63
  A. National Security 63
  B. Energy, Environment, and Related Sciences and Engineering Role 64
  C. Cleanup of Radioactive and Chemical Wastes 64
  D. Science-Engineering 65
  E. Economic 66
  F. Governance 66

Appendices

A. EXCESSIVE OVERSIGHT AND MICROMANAGING

B. IF GOCO SYSTEM IS OBLIGED

C. TERMS OF REFERENCE

I. Overview

A. Introduction

This Task Force was asked to propose alternate futures for the Department of Energy laboratories noted in Figure 1(see inside front cover). The Task Force Charter is provided in Appendix C. Our intensive ten months' study revealed multiple missions and sub-missions – traditional missions and new missions – programs and projects – each with factors of merit. Each iteration of our study would nevertheless still confound even the members of the Department and laboratory community, as evidenced by the oft-quoted statement: "the laboratories, and indeed the Department, require a clearer, more focused statement of mission!". Our sorting of these matters has led us to a synthesis which when first revealed may appear too simple, too limiting or even too much of a play on words. But we respectfully suggest that this synthesis identifies an essence – the essence of what the Department, and particularly the laboratories, should and do stand for: the energy agenda.

Virtually everything the laboratories do "is" energy. The original laboratories' first assignment was a nuclear energy bomb – developing the fuel, storing and containing the energy, and releasing the energy. More laboratories were formed and/or augmented in response to other energy needs which occasionally were identified as crises. Newer laboratories have credentials (among other credentials) for conservation and renewable energy. Most of the laboratories are concerned and resourced to deal with the various effluents of energy and its applications *vis-a-vis* the environment. The aggregate of science and technology competencies of the laboratories has served, and continues to serve, as one essential resource for the study of energy.

At many given points in time energy is the paramount issue in our lives. A blackout in a nearby neighborhood or industrial plant is always headline news. Long lines of vehicles responding to (infrequent) fuel shortages capture everyone's self-interest. Although we are privileged to more often take energy availability for granted in the United States, we still press for longer battery life for our cellular phones and worry that some day we will run out of petroleum. Energy is so central to the vitality of our dynamic country that it has to be a priority concern as an ongoing national strategic issue. It may be legitimately referred to as an issue of importance to our general long-term national security.

As we were in the latter stages of writing this report, occasional speculation surfaced concerning the continuing role of the Department of Energy, and suggesting in part that energy is not all that important. Such major agency structure issues are beyond our purview, but we do feel justified in asserting that the energy agenda which we will profile in this report does require central, federal, senior cognizance and appropriate government sponsorship in the interest of the short-term and long-term overall quality of life in America and the world. We will shortly make the point that the laboratories are essential (with appropriate changes, of course) in these regards. The laboratories we studied require a strong federal financial support and linkage or sponsorship, at least for a goodly number of years, for reasons that will be evident throughout this report. The Department can serve this role, appropriately redefined, well.

Returning to the subject of mission, we find ourselves comfortable with a mission whose meaning is bound up in serving energy opportunities. We introduce the thought with words that are not capitalized because we do not want to presume to capture as graphic art an all-encompassing meaning in a few short words. Nor do we believe that the Department or laboratories have been adequately served by articulating virtual slogans in some of its noble efforts at projecting its purposes. Yet, even if one flashes the message "Serving the Energy Opportunities" on the proverbial screen, in its own quiet way it conveys what almost every other existing mission or program or project intended.

Let us narrow in on the word *energy* and its meaning. The word serves as the remarkable root word for defining mission(s) within a progressive parameter. At one and the same time, it gives focus and gives a wide-ranging field of relevant explorations.

Elsewhere in this report one will find our recommendation of need for focus – a parameter of sorts to the roles of the laboratories. Yet it is not inconsistent that simultaneously we recommend the laboratories must be free to renew and press the frontiers in all relevant affordable ways in behalf of their energy agenda, broadly defined.

Our working definition of Energy is: Energy is the capacity to do work. The Physical, Chemical, and Biological Sciences which are used to derive fuels from natural resources are in turn enabled by Energy. Conventional energy sources include wood, water, oil, gas, coal, and nuclear fuels. The growing U.S. and world population requires all these, as well as new source such as solar energy, biomass, and wind energy. All must be made clean, safe, less expensive, and in the aggregate, abundant. Energy may be sourced centrally, locally, or portably. It must be generated, transformed, distributed, and properly utilized from all these sources. Future sources may include, for example, hydrogen, which is abundant in water, gas, and biomass; albeit a challenge to "extract" and store. DOE laboratory scientists have decades of experience with hydrogen and other basic sources. Their multidisciplinary competencies hold the promise of solving many such challenges.

The rest of the world has an energy agenda of sorts as well. This agenda is to obtain for their people access to energy supplies comparable in all respects to those we now enjoy. This global energy agenda represents a huge opportunity for the U. S. energy industries. It also represents a competitive threat to those industries if they have not prepared and committed first to serve the right "product." Finally, it represents a threat to our country and other countries if some nations employ technologies for energy production and usage which increase global pollution levels. Our purveyors to those expanding producing and using societies must be prepared to offer better. While serving the needs of our country with the leading edge of technology, we can best serve the needs of other countries, both environmentally and commercially, when we support them with technologies derived or derivable by the laboratories. All these self-evident contributions from the laboratories are in addition to the national security, defense and weapons stewardship role that gave birth to the first laboratories. This latter role will be a continuing irrevocable obligation for a minimum of two score more years.

The laboratories' research role is a part of an essential, fundamental cornerstone for continuing leadership by the United States. We know that the studies and discoveries of science unravel the elements of nature and shower benefits on mankind. We know by intelligent estimates that there is much more to be learned and shared. We know that these scientific revelations will unfold from many sources: a brilliant insight by an individual, a research team at a university, a corporate or government laboratory – by accident, or on purpose. We know progress is hastened where diversity of personnel and institutions is encouraged.

We note that many of the least exploited investigative paths involve the need for extraordinarily sophisticated multidisciplinary teams using sophisticated instruments and tools. It is that role for which the national laboratories are uniquely qualified. It is the case for – the justification of – the existence of the DOE laboratories.

Yet most citizens do not know enough about the laboratories. We do not know the thousands of insights, new directions, new phenomena, new principles, materials and processes that blanket these laboratories' science spectrum, all relevant to an energy agenda. Examples include the world's most intense X-ray sources; biomedical isotopes; chlorofluorocarbon substitutes; computer models of combustion for cleaner energy; laser isotope separation; lasers for pollution monitoring; neutron sources to probe materials and biological systems; the unraveling of the puzzles of the human genetic code; the harnessing of the wind, sun and earth for renewable energy; superconductivity; global ocean and atmospheric studies; detection and tracking of nuclear materials; fossil, fission, fusion energy; novel semiconductor materials and devices; laser destruction of blood clots; bioremediation of radioactive and hazardous waste; accelerator technology for medical applications; and remediation of radioactive storage tanks. These are but a few examples.

We are inclined to typecast these institutions simplistically by a few prominent contributions such as yesterday's bomb or the discovery of an element on the periodic table (both grand achievements), but overlook the multitude of other continuing achievements. We must reach out to know enough of this vast spectrum of accomplishments to justify our deserved support of these institutions that have contributed, are contributing, and will in the future contribute vital knowledge while continuing to revitalize themselves – just as science always renews itself. We must be in quest of that which we do not know in the field of science in every relevant way. Each revelation will enrich us manyfold. The laboratories we review here are essential to the fulfillment of our need to know.

Under the overarching energy agenda – the labs serving the energy opportunities – we will comment on their national security role, the all important energy role, all related environmental roles, the science and engineering underpinning for all the above, a focused economic role, and conclude with governance / organization change recommendations.

B. Missions of the National Laboratories

The Task Force believes that a change of governance of the national laboratories is necessary regardless of the missions of these multi-program institutions. However, we also have strong views regarding the appropriate mission activities for the laboratories. One general observation of the Task Force is that the national laboratories, and the Department, appear to believe that they have the potential to serve an extraordinarily broad role in scientific investigation and technical research for the nation. The Task Force does not support this view. Rather, we see the laboratories as having clear areas of expertise, yet limited to their traditional mission areas of national security, energy, and environmental science and technology, as well as in the fields of fundamental science which underpin these missions and in basic science associated with high energy, nuclear, and condensed matter physics.

While the Task Force supports innovative application of the national laboratories' core technical competencies (for example, high performance computation, advanced materials, energy technologies, and systems engineering) to new problem areas, these activities should be carefully managed, are not likely to evolve into "new missions" per se, and should not be a license to expand into areas of science and technology which already are being addressed effectively or more appropriately by other Research and Development (R&D) performers in government, academia and the private sector.

The Task Force does believe that the national laboratories serve a distinctive role in conducting long-term, often high-risk R&D, frequently through the utilization of capital-intensive facilities which are beyond the financial reach of industry and academia, and generally through the application of multidisciplinary teams of scientists and engineers. We believe that an appropriate division of labor among the national laboratories, industrial research institutions, and research universities can be established but does not sufficiently now exist.

The Task Force concluded that the work of these laboratories contributes in an important, though generalized fashion to the security interests of the nation, when security is defined broadly to include factors such as:

- Developing technologies which enhance the ability of the nation to deter and defend against military threats, to reduce the nuclear danger, and enhance confidence in our own nuclear weapons in the absence of explosive testing;

- Enhancing the prospect for sound patterns of energy use through the development of diverse, efficient, and sustainable energy technologies;

- Reducing environmental threats posed by the waste legacy of the nuclear weapons program and by the careful utilization of energy and materials throughout the economy; and,

- Expanding the base of scientific information – which is one of the nation's greatest long-term strategic assets – through pioneering work in a number of areas of fundamental science mostly related to the energy agenda.

One general observation about the missions of the laboratories is that the Task Force found it ironic that these institutions seem to be searching so hard for "New missions" when there remains a compelling agenda of important work to be performed in their traditional mission areas. The Task Force believes:

- The existing budget of the national laboratory system exceeds that required to perform its agenda in the areas of national security, energy, environment, and fundamental science;

- It is unrealistic for these institutions to attempt to retain their current size by laying claim to "new missions;" and,

- The urgent requirement for these laboratories is to provide more disciplined focus on the new research needs within the traditional set of mission areas, as described below.

Later we identify savings through reorganization which can be variously used to reduce budget, redeploy resources, and increase research in appropriate areas.

1. National Security

The primary national security mission of the DOE laboratories is to provide for a safe, secure and reliable nuclear stockpile in the absence of explosive testing of nuclear weapons. Continued scientific, engineering, and managerial excellence will be required at the laboratories to meet the complex and demanding stewardship role. A vital extension of this mission involves work in non-proliferation, counter-proliferation, arms control verification, and intelligence support. Another critical and daunting national security task for which the weapons laboratories have special expertise involves the safe tracking and disposition of fissionable materials.

2. Energy

The primary mission for the laboratories in relation to energy technologies is to pursue a research and technology development agenda which enhances the long-term prospects for adequate energy supplies and efficient end use technologies which minimize adverse environmental impacts. The primary role for the laboratories should be in areas where long-term research holds the prospect for significant payoffs, and where a clear public purpose is being served through Federal support. To the maximum extent possible, energy R&D at the laboratories should be coordinated with the private sector and be guided by technology road maps.

3. Environmental Science and Technology

The Department faces a monumental task in dealing with the radioactive and hazardous wastes at its former nuclear weapons production sites and national laboratories. This task cannot be addressed in an affordable fashion using today's technologies. The national laboratories have expertise and untapped potential which could accelerate the scientific and technological base which is urgently needed for the cleanup mission.

The laboratories also have significant contributions to make in research and development related to more efficient utilization of energy and materials, such as pollution prevention and waste minimization techniques, and also in areas associated with the environmental impacts of energy use, as in global climate modeling. The Task Force believes that the laboratories have areas of demonstrated expertise that could provide the basis for an expanded mission in environmental research and technology development, but such expansion should occur only in areas where the laboratories have a comparative advantage to other R&D performers in academia, industry, or other government agencies.

4. Fundamental Science

The national laboratories have a major mission to serve in contributing to the scientific foundation which underpins the Department's other mission areas: national security, energy, and the environment. The laboratories also have important responsibilities in certain discrete areas of science for which mission applications are not immediately apparent– such as in high energy, nuclear, and condensed matter physics– but where contributions to the nation's scientific enterprise have been significant.

Such contributions often have derived from large-scale scientific user facilities that have been built and operated at the national laboratories (as well as at the Department's program-dedicated laboratories). Such facilities have enabled government, academic, and industrial researchers to explore scientific frontiers that have not been accessible in other ways. Long-term, fundamental research of this form has been part of the national endeavor to create a better future through investments which could have a transforming, yet unknowable impact on society. The Department should sustain and strengthen its support of fundamental science.

5. Industrial Technologies

Development of technologies for which private sector companies are the major beneficiary is not an appropriate mission for the national laboratories. Rather, the economic impact of R&D performed for such general benefit by the national laboratories should be viewed as a derivative, or outcome, of the other core missions. Collaborations between the national laboratories and the private sector serve the important function of providing dual benefits to the partners, but such collaborations generally should be closely aligned with core mission areas of the Department. To the extent appropriate, such collaborations should be cost-shared and tied to technology road maps developed by and with industrial sectors.

C. Laboratory Governance

Our study revealed a counterproductive federal system of operation (Department, Contractor, Laboratory and substantially driven by Congressional policies). A far-less-federal system must be authorized by the Congress, adopted by the Department and implemented at the laboratories, possibly involving contractors. Certain far-less-federal systems promise large productivity gains with attendant major economies along with refreshed motivation by empowerment of the laboratory's greatest assets – its devoted professionals. We urge embracing such a new concept promptly, adopting one or more new configurations early, and moving into a perfectible system apace, much as many non-federal institutions are doing with rich rewards.

The Task Force observed multiple symptoms of institutional stress at the national laboratories, including the following:

- Increasing overhead cost, poor morale and gross inefficiencies as a result of overly prescriptive Congressional management and excessive oversight by the Department;

- Inordinate internal focus at every level of these laboratories on compliance issues and questions of management processes, which takes a major toll on research performance;

- Excessive scrambling by the laboratories to establish programmatic activities in "new mission" areas, at the expense of disciplined focus on traditional assignments in national security, energy, waste management and environmental quality, and fundamental science;

- Confusion regarding the appropriate character, scope, and scale of laboratory collaborations with the private sector, due to a lack of clear policy guidance from the Department;

- Institutional fragmentation as a direct reflection of segmented management of the laboratories by the Department, which treats the laboratories not as integrated institutions – let alone a system of laboratories – but rather as a conglomerate of hundreds of individual projects, each of which has a program manager with independent influence on elements of the laboratories;

- Financial and institutional burdens on the laboratories as the result of an apparent inability by the Department either to downsize facilities which have excess capacity or to terminate programs which provide neither distinctive nor essential contributions to the national research and development enterprise; and,

- Management systems at the laboratories that do not exhibit best business practices, and thus compound the management challenges of these complex institutions.

The Task Force recognizes that many of the Department's laboratories are considered to provide some of the highest quality R&D among the federal laboratory system. With this understanding, the Task Force had the option of simply concluding that the problems facing the national laboratories were simply a fact of life of federal governance and that little more could be expected. The Task Force has no comfort with such an assessment, feels that it is reasonable, and indeed necessary to have much higher expectations for performance from these institutions, and believes that incremental solutions will not likely provide the major improvements that are, at once, achievable and necessary.

We arrived at this conclusion recognizing that conventional wisdom likely would provide a range of reasons why establishing a new system of governance for the laboratories might be impractical or jeopardize these assets. In our view, however, the long-term quality and effectiveness of these laboratories already is in serious jeopardy, owing to patterns of management and organization that have grown in complexity, cost, and intrusiveness over a long period. For those who have been long time employees, managers, or observers of the national laboratory system, perhaps it is easy to rationalize that the system in place is simply the way it is and the way it always will be. For those without lengthy associations with the Department or its laboratories – which was the case for a majority of the Task Force members – it is hard to reach any conclusion other than that the current system of governance of these laboratories is broken and should be replaced with a bold alternative. The Task Force seeks not to be bold for boldness sake, but because it believes that a far more effective system of governance is necessary.

While this report provides a general description for a not-for-profit framework for governance of the laboratories, we do not presume to know what the precise alternative architecture should be. That can and should be developed by Congress, the Department, and the laboratories, based on experience gained from existing research institutions which receive substantial funding support from the Federal Government, but which have an independent management structure which makes the decisions on how best to deliver the services which the Government is procuring. Insight also should be gained from the experiences of other nations, including the United Kingdom, which recently has maneuvered a disengagement of several of its government laboratories into a semi-privatized status.

A major experiment implementing wholly new management practices for the national laboratories does invite risks, and certain hazards must be recognized and guarded against within any implementing legislation. For example:

- Those national laboratories that work on nuclear weapons programs may not be appropriate candidates for transfer to a non-federal governance structure, especially given the need for continued stringent controls on all aspects of nuclear weapons design activities. Some Task Force members think they are. Some think they are not.

- The proposal to introduce a bold new paradigm for governance of these institutions must not be used as a political pretext to dismantle or destroy a system of laboratories which has served the nation well in the past, are continuing to perform important public functions, and holds the prospect for delivering new scientific insights and technological innovations which will justify its continued value to the Nation.

- Protection must be built into the governance structure to ensure that these institutions continue to perform long-term, fundamental research – which is among their most distinctive contributions to the nation – and not be driven to a short-term focus characteristic of "job shops" for the private sector. This goal could be reached through prescribed allocations which provide an inviolate base of federal funding support for certain critical areas of fundamental research and their associated large research facilities.

- It will be necessary to ensure that the change in governance is structured in a fashion to achieve the desired results, and that the new system not be burdened by creeping micromanagement, non-productive oversight, and institutional fragmentation which characterizes the present state of affairs at the national laboratories.

- A balance must be achieved between the need for necessary continuing oversight and reduction of environmental damage on the one hand, and the need for avoiding overwhelming the new organizations with excessive burdens and inherited environmental responsibilities on the other hand.

D. Configuration of the Laboratories

The Task Force believes that the national laboratory system is oversized for its current mission assignments. This appears to be the result of inefficiencies that stem from the current management practices of the laboratories and the DOE; excess capacity in areas associated with nuclear weapons design and development; and political considerations which have inhibited downsizing and laboratory restructuring. The Task Force believes that the national laboratory system serves many vital functions, but that the system could be productively downsized (or "rightsized") through the elimination of functions and redundancies. The Task Force further believes that one goal of any downsizing should be enhanced focus on specific mission assignments. Through downsizing, there may be opportunities in the future to convert one or more multi-program laboratories into institutions dedicated to only one primary mission.

The Task Force strongly believes that the laboratories should work more closely as a system, with the goal of achieving enhanced coordination and integration of complementary strengths. However, we note that such coordination will be made more difficult to the extent that the laboratories are separated into independently operated not-for-profit organizations.

While the Task Force does not make any recommendations about the possible closure of specific laboratories, we have a general view that all of the national laboratories should be subjected to a regular process of comparative validation against other research performers (including against each other) to judge options for closure, consolidation, and even expansion of programmatic activities and facilities. The Task Force believes that an alternative structure of governance for the laboratories that achieves greater independence of the laboratories from the Department would invite enhanced pressures for competitive performance, which would lower costs, force the elimination of redundancies and less than world-class capabilities, and achieve enhanced value for the public investments involved.

II. The National Security Role

A. Introduction and Background

1. The Changing Environment

The Department of Energy's national security mission is based on the Manhattan Project, the development of nuclear weapons during and following World War II. The legacy includes independent design capabilities, redundant design teams, competition, and intense efforts to achieve the highest standards of safety, surety and reliability. The three weapons laboratories – Lawrence Livermore, Los Alamos, and Sandia National Laboratories – have evolved over a period of more than fifty years. It is clear that they played a key part in the successful outcome of the nuclear standoff with the former Soviet Union. For this, the entire nation owes a debt of gratitude to the women and men of these laboratories, past and present, who gave their talent to this successful endeavor.

The end of the Cold War has brought substantial change. Weapons modernization, arms control agreements, the fear of proliferation of weapons of mass destruction, and the significant decline in defense spending require a restructuring of the laboratories' support for the national security mission. Today, these laboratories represent an extraordinary national resource of people, facilities, and experience. Every attempt should be made to use this resource as missions change.

2. National Security Requirements

The requirements for the DOE and the weapons laboratories are based on Presidential direction as approved in the Nuclear Stockpile Document and other Presidential Decision Directives. Congress provides direction in laws and committee reports. The Department of Defense (DOD) determines specific weapons requirements and the Department of Energy determines how to fulfill those requirements. The weapons laboratories then are assigned specific responsibilities and funding to carry out DOE direction.[1]

The President stated in the National Security Strategy (July 1994) that a safe, secure and reliable U.S. nuclear deterrent remains a cornerstone of U.S. national security policy. The President announced a moratorium on underground nuclear testing with a goal of establishing a comprehensive test ban. He instructed the DoD and DOE to explore means other than nuclear testing to maintain confidence in the safety, reliability and performance of the weapons stockpile. He also directed strong efforts to support the Non-Proliferation Treaty and counter weapons of mass destruction. This direction is the basis for DOE and DoD planning for the future and the Task Force's consideration of alternate futures for the weapons laboratories.

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[1] The weapons laboratories are Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), and Sandia National Laboratories (SNL). LLNL and LANL are weapons design laboratories while SNL is the engineering laboratory.

The maintenance of a safe, secure, and reliable stockpile, contributions to critical proliferation and treaty issues, and participation in other national priorities related to this mission are essential parts of the nuclear weapons laboratories' future and require adequate facilities, motivated and capable people, and the requisite budget. This future will require new types of management, different technical personnel, and a mode of operation that is closer to industry's than the laboratories have practiced in the past.

3. Specific Weapons Requirements

The Department of Defense conducted a Nuclear Posture Review[1], approved by the President, to determine future nuclear forces and weapons requirements. Implementation of the START I and START II protocols will result in a total nuclear weapons reduction of 79% by the year 2003. As a unilateral action (Presidential Nuclear Initiatives I and II), the U.S. will reduce by 90% non-strategic nuclear weapons. These steps will result in a required stockpile of around 5000 weapons.

The Nuclear Posture Review identified the need for flexibility either to accelerate the drawdown if both sides implement START II more quickly, or the ability to return inactive weapons to service if the Russians suspend or delay START II implementation. The weapons laboratories need the capability to respond to either circumstance.

Over the past two years, the Department of Energy has established the Science-Based Stockpile Stewardship Program, replacing a test-based stockpile stewardship, to maintain confidence in nuclear weapons without nuclear testing. The focus of the new program includes improving experimental capabilities, enhancing computational capabilities, advanced stockpile surveillance, advanced manufacturing and materials capability, maintaining system engineering and infrastructure and preserving a nuclear design and experimentation capabilities.

B. Main Findings and Recommendations

Specific recommendations regarding the future of the weapons laboratories fall into broad categories of mission, key personnel, configuration, peer review, basic science, research facilities, and weapon production (including research, production, tritium, and management). The Task Force believes that these recommendations are consistent with Presidential Directives,[1] the Nuclear Policy Review, and the Science-based Stockpile Stewardship Program.

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[1] Brigadier General Anthony Tolin, USAF, Strategy and Policy, Joint Staff, private briefing on the Nuclear Posture to the National Security Subgroup of the Task Force, October 14, 1994.

1. Mission

The national security mission of the weapons laboratories has been rearticulated to emphasize maintaining credibility in the U.S. nuclear stockpile in the absence of explosive testing of nuclear weapons. The primary mission of the weapons laboratories must be a safe, secure, and reliable stockpile. Science-based stockpile stewardship (in comparison to a test-based stockpile program) is the approach chosen by the Department of Energy to achieve this mission. It requires the following rank-order priorities for the core functions of stockpile stewardship as follows:

1. Attracting and retaining skilled scientists, engineers, and managers over the years ahead with the expertise required for the complex and demanding stewardship role;

2. Enhancing surveillance of weapons in the stockpile[2], during dismantlement, and of the nuclear materials that accumulate as a result of that dismantlement;

3. Continuing hydrodynamic testing as required to cope with problems;

4. Assessing problems, reanalyzing previous data through numerical simulations, and developing appropriate data bases; and

5. Sustaining the scientific process of inquiry through experimentation.

In today's world, proliferation of nuclear and other weapons of mass destruction remains a major threat to U.S. national security. Because of this threat the DOE laboratories' work in non-proliferation, counter-proliferation, verification, and intelligence support has become a major mission as well as an extension of their stewardship of the nuclear stockpile. These activities are supported by the expertise maintained within the entire nuclear weapons infrastructure. It is important that their funding be included within the core infrastructure support. The Task Force notes that organizational compartmentalization within the Department complicates and makes difficult the appropriate inter-relationship and funding balance between stockpile support and non-proliferation, and recommends that the Department's organization reflect their importance and interdependence.

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[1] Steven Andreasen, Strategic and Nuclear Affairs, National Security Council, private briefing on Presidential Decision Directives to the National Security Subgroup of the Task Force, August 9, 1994.

[2] Current weapons designs are secure, safe and reliable. There is no threat to the nation that would justify the development of a new nuclear weapon at this time. If weapons in the stockpile should develop problems that cannot be resolved, and that raise doubts about their reliability or safety, consideration could be given to the option of replacing them with modernized versions of earlier, very robust, well-tested designs. However, the safety and reliability record of the stockpile indicates the successful resolution of all past weapons problems; any future reliability or safety problems should be first analyzed and solved -- if possible -- by the replacement of specific components or addition of new safety features if needed.

2. Attracting and Retaining Scientists, Engineers, and Managers

The weapons laboratories' management has an important responsibility to identify the critical skills required for their national security mission and to manage the hiring and retention of key personnel accordingly. The Task Force recommends that management continue to sustain a stimulating intellectual environment that will attract and retain the very best research and engineering staff. This will require:

- Providing appropriate rewards for high performers;
- Weeding out weaker performers; and,
- Engendering in the research and engineering staff a sense of achievement, based on personal responsibility and personal accountability.

3. Configuration of the Nuclear Weapons Laboratories

The current structure of the three nuclear weapons laboratories should be examined in light of the recently revised, official U.S. Nuclear Posture. The Department of Energy should size its nuclear weapons laboratories support efforts over time to match DoD requirements. The restructuring must be accomplished in ways that preserve capabilities both for reduction to lower levels of support and for an expansion of support should the resumption of a threat to national security demand it. In addition, the restructuring must support the requirement to maintain confidence in the nuclear stockpile in a comprehensive test ban or under an extended moratorium. The restructuring will affect primarily weapons design capabilities, where the largest functional redundancy exists, and specifically Lawrence Livermore National Laboratory (LLNL); LLNL supports only four of eleven weapons designs currently in the U.S. stockpile.

The Task Force believes LLNL should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter-proliferation, intelligence support, and verification, to provide independent review for several years while alternative approaches to peer review are developed (see "Peer Review"), and to participate in weapons relevant experiments on the National Ignition Facility (NIF). LLNL would transfer, as cost-efficiency allows, over the next five years its activities in nuclear materials development and production to the other design laboratory. LLNL would transfer direct stockpile support to the other weapons laboratories as the requirements of science-based stockpile stewardship, support of the DoD nuclear posture, and the status of test bans allow. Under these conditions, the Task Force believes that the transfer can be made in five years. The Task Force notes that if the NIF is built at LLNL, this will reinforce the weapons design capability at that laboratory.

4. Peer Review

The Task Force believes that the development of independent assessment of the safety and reliability issues within an aging stockpile will be an ongoing requirement of stockpile stewardship. It also believes, however, that there are many ways in which this peer review function can be served, and that peer review, in and of itself, does not justify the existence of two nuclear design laboratories.

5. Contributions to Basic Science

As new facilities are developed at the weapons laboratories for performing science-based stockpile stewardship, the Task Force recommends that these facilities be managed in as open and collaborative a fashion as national security constraints will permit.

6. Major Research Facilities

The Task Force recommends the following:[1]

- Continued funding support for the Dual-Axis Radiographic Hydrodynamic Testing (DARHT) facility;
- Continued near-term support for Los Alamos Neutron Scattering Experiment/Los Alamos Meson Physics Facility (LANSCE/LAMPF);
- Continued pursuit of advanced computing, including computing through workstation networks; and,
- Proceeding with the National Ignition Facility (NIF) as a research facility, prioritized with respect to other major research investments.

In its favor, NIF will provide a unique means for doing very important experiments involving extremely high temperatures in condensed matter physics and it thus will make it possible to maintain expertise in one of the areas of physics fundamental to modern nuclear weapons design. Similarly, the data and theory it will produce will contribute uniquely to science generally and to astrophysics in particular. On the other hand, there is some possibility that NIF will inadequately simulate secondaries, although this is already a lower priority than understanding primaries. There is a low probability that inertial fusion will become a useful source of energy in the foreseeable future. NIF may not attract the scientists and engineers that stockpile stewardship really needs. NIF may also complicate discussions at the Non-Proliferation Treaty review conference and negotiations of a Comprehensive Test Ban Treaty. In short, NIF is a risk (as are most major research projects), but on balance the Task Force supports its construction. An important consideration is that the question of whether or not NIF is built at LLNL, when combined with other recommendations for change given in this report and elsewhere that could define the future of that laboratory.

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[1] The Jason Stewardship report entitled Science Based Stockpile Stewardship, August 10, 1994.

7. Non-Nuclear Research Requirements

The Task Force recommends that non-nuclear research activities continue at the weapons laboratories as long as a paying customer requires them, as they are rooted in nuclear weapons research, contribute to core R&D, and pay their fair share of overhead and basic research support.

8. Nuclear Weapons Production Capacity

There is no need for nuclear weapons production at this time nor is start-up of production envisioned for problems expected in the stockpile. Capability-based deterrence requires, however, the potential for weapons production in the event of increased threat that may arise in the future. The current world situation and the existing production capability do not mandate investment in additional production capability. The Task Force recommends that future production should be based on the residual capabilities of Pantex, Los Alamos National Laboratory, and Sandia National Laboratories, and believes that no further investments in production capability are needed at this time.

9. Tritium Supply

Accelerator-based production of tritium looks attractive, given today's understanding of the technology. The Task Force, however, does not make a recommendation relative to replacement, or to the mode of production, but rather supports continued R&D in accelerator-based production of tritium.

10. Management of the Nuclear Weapons Laboratories by DOD

As requirements for national security change, DoD and DOE must size their organizations and improve their coordination for maximum effectiveness. The DoD must act as an intelligent and prudent customer regarding nuclear weapons. The separation, within the U.S. government, of nuclear weapons development and operations is a long tradition and has recently been challenged in the interest of efficiency. The Task Force, however, agreeing with most previous studies of this issue, sees no compelling reason for DoD to manage the national security activities at the weapons laboratories. Indeed, the Task Force believes that there is much value at this time in maintaining an independent and technically expert organization to focus on nuclear stockpile issues and to continue to ensure that decisions regarding the safety, control, and stewardship of nuclear weapons are raised to the high policy level that they deserve. The corporatization proposal contained in Section VII in the Task Force report could eliminate the management issues for both DoD and DOE and give a customer focus to the weapons programs.

C. Summary of Recommendations

1. *The primary mission of the weapons laboratories must be a safe, secure and reliable nuclear stockpile in the absence of explosive testing. Science-based stockpile stewardship is the approach chosen be the Department to achieve this mission. It requires the following rank-order priorities:*

   - Attracting and retaining skilled scientists, engineers, and managers over the years ahead with the expertise required for the complex and changing stewardship role;
   - Enhancing surveillance of weapons in the stock pile, during dismantlement, and of the nuclear materials that accumulate as a result of the dismantlement;
   - Continuing hydrodynamic testing to cope with problems;
   - Assessing problems, reanalyzing previous data through numerical simulations, and developing appropriate data bases; and
   - Sustaining the scientific process of inquiry through experimentation.

2. *Non-proliferation, counter-proliferation, verification, and intelligence support have become a major mission along with stewardship of the nuclear stockpile. The Task Force notes that organizational compartmentalization within the Department complicates and makes difficult the appropriate inter-relationship and funding balance between support and non-proliferation, and recommends that the Department's organization reflect their importance and interdependence.*

3. *The Task Force believes Lawrence Livermore National Laboratory should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter-proliferation, verification, and intelligence support, to provide independent review for several years while alternative approaches to peer review are developed, and to participate in weapons relevant experiments on the National Ignition Facility (NIF). Lawrence Livermore National*

Laboratory would transfer as cost-efficiency allows over the next five years its activities in nuclear materials development and production to the other design laboratory. Lawrence Livermore National Laboratory would transfer direct stockpile support to the other weapons laboratories as the requirements of science-based stockpile stewardship, support of the DoD nuclear posture, and the status of the test bans allow.

4. *The Task Force recommends continued funding support for the Dual-Axis Radiographic Hydrodynamic Testing (DARHT) facility; continued near-term support for the Los Alamos Neutron Scattering Experiment/Los Alamos Meson Physics Facility (LANSCE/LAMPF); continued pursuit of advanced computing, including computing through workstation networks; and proceeding with the National Ignition Facility (NIF) as a research facility, balanced with respect to other major investments.*

5. *The Task Force recommends that future production needs should be based on residual capabilities of Pantex, Los Alamos National Laboratory, and Sandia National Laboratories, and believes that no further investments in production capability are needed at this time.*

III. The Energy, Environment, and Related Sciences and Engineering Role

A. Main Findings

This section of the report reviews the laboratories' energy and environmental roles (minus activities associated with clean-up of waste sites, which are dealt with in Section IV), and includes the Task Force's general observations about missions of the laboratories.

1. The Energy Mission of the Laboratories

The national laboratories have an important energy mission which, in the view of the Task Force, remains absolutely vital to the national security and economic welfare of the nation. This mission started with the efforts to create peaceful uses of nuclear energy (a major goal of the civilian Atomic Energy Commission) and assumed new direction and urgency as a result of the energy crises of the 1970s. The 1973 oil embargo prompted Congress the following year to create the Energy Research and Development Administration (ERDA), folding together nuclear programs from the Atomic Energy Commission (AEC), fossil energy and utility distribution programs from the Interior Department, solar and geothermal programs from the National Science Foundation, automotive propulsion programs from the Environmental Protection Agency, as well as several other dispersed functions. Although the Energy Research and Development Administration (ERDA) was to be a transitional agency, replaced by the Cabinet-level Department of Energy in 1977, progress was made in bringing together diverse energy activities previously scattered among many federal agencies. One legacy of the Department's origins, however, is that the different areas of energy supply and end-use R&D remain balkanized--operating as isolated fiefdoms. Additionally, the Department's applied energy programs are not well integrated with either the Department's environmental or basic science programs.

The Task Force believes that one of the most important challenges facing the Department and its laboratories is to achieve greater integration of its various applied and fundamental energy R&D programs (i.e. fossil energy, nuclear fission and fusion, energy efficiency, renewable energy, and basic energy sciences). The integration that is necessary should be both internal, into a portfolio of programmatic activities organized according to a common framework of policy objectives, and external, including both cross-governmental, and Department-private sector initiatives. In the Task Force's view, there is a long list of exciting, challenging, and vital areas of research and technology development that constitute the appropriate energy agenda for the laboratories.

It is important to note that the Department's applied energy programs are executed in a variety of ways, including at the laboratories, both with and without industry cost-shared involvement; directly between the Department and industry, through cost-shared collaborations; and directly with universities. Of the Department's FY 1994 applied energy budget of roughly $1.8 billion, only 30 percent is expended at the laboratories. The Task

Force recognizes that another group of the Secretary of Energy Advisory Board is examining the applied energy programs;[1] however, in the course of our examination we did develop firm views about the energy mission both at the Department and the laboratories.

In general, the Task Force believes that the energy mission is of extreme importance and deserves greater attention by the national laboratories, working in collaboration with the private sector. Additionally, we believe that the Department needs a framework for rationalizing the management of energy supply and conservation technologies in terms of a strategic portfolio of research and development projects.

National and Global Energy Needs

During the next 20 years, world energy demand will grow by 50 percent. Most of this growth will occur in the developing world, where energy is perhaps the single most important factor for economic expansion and enhanced quality of life. Given the environmental impacts of current modes of energy use, research on means of enhancing the efficiency of energy utilization and on substitutes for fossil fuels is of critical national importance. Although oil, natural gas, and coal will remain the dominant energy source in the world for the next 20 years – still providing as much as 80% of the global energy supply in the year 2015 – the development of clean, sustainable, alternative forms of energy will be essential as projected fossil fuel supplies dwindle and environmental constraints mandate a dramatic switch in fuel sources during the next century. The global market for clean energy sources could be in the hundreds of billions of dollars 20 to 30 years from now, yet the R&D involved is of a sufficiently high-risk and long-term nature, and the public purpose of this research is sufficiently compelling, that it properly should be addressed through collaborative work between the public and private sectors.

The Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources (including photovoltaics, biomass, wind, geothermal, and hydrogen), and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D. The Task Force was divided concerning a recommendation for the level of support needed in the area of fusion energy. At a broader level, the Task Force believes that the Department's energy programs should be managed more as a portfolio of investment areas, giving appropriate attention to the diverse and sometimes conflicting goals in various areas of energy supply and conservation R&D. These goals must be balanced with the overall energy objectives of the Department – which must be based on the national goals for energy development and utilization.

These goals must be coordinated closely with the energy supply industry, with makers and users of energy conservation technologies, and with other stakeholders to develop a meaningful strategic plan for investments in energy supply and conservation technologies.

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[1] Strategic Energy Research and Development Task Force, Chaired by Daniel Yergin, President, Cambridge Energy Research Associates.

This is the most important single aspect of the rationalization of the energy R&D work of the Department. A consensus must be developed among potentially competing technologies, users, and stakeholders that defines the R&D needs of the nation in sufficiently explicit terms that conclusions can be drawn to guide the implementation of a rational R&D strategy.

Alliances with the industrial users of the technology will be critical. R&D produces knowledge, but the implementation of that knowledge in plants and products must be done by industry. If industry is not intimately involved in the planning and development of that knowledge, they will be slow to implement it if they do so at all. The Department currently has several major collaborations in place with the Gas Research Institute, Electric Power Research Institute, fossil fuel extraction companies, and energy-intensive industrial sectors, such as the pulp and paper industry. The Task Force commends these efforts, which help guide appropriate areas of government vs. private sector R&D, and help ensure eventual commercialization of new technologies and processes.

The Task Force recognizes, however, that the energy mission of the Department is broader than the interests of the existing private sector in important ways. For example, both energy producing and energy using industrial sectors will have an inevitable bias toward existing technologies and infrastructure, and a relatively short-term outlook. The Department, on the other hand, must consider the long-term energy and economic security of the nation, which are closely linked. Accordingly, the Department must be careful to ensure that, while working closely with energy producers and users, its energy R&D program is not captured or dominated by short-term interests, since the most appropriate areas for laboratory investment using public funds will be in areas which address long-term uncertainties and needs.

Within the portfolio concept, each area of energy technology, and indeed potentially each R&D project, should be evaluated in terms of four key elements:

- Technological strength;
- Technological maturity;
- Competitive impact on public objectives (i.e., energy, efficiency, energy diversity, environmental protection, economic impacts, cost); and,
- Risk.

Section VI of this report provides additional considerations regarding the development of applied energy work at the laboratories.

2. The Environmental Mission of the Laboratories

The DOE laboratories have a diversified environmental mission, which includes two traditional areas of activity and one emerging area. The traditional areas are science and technology development associated with the clean-up of nuclear waste (addressed in Section IV), and R&D related to assessing the environmental impacts of energy use (e.g. global climate modeling, atmospheric chemistry). The emerging area involves systemic approaches to reducing energy and materials consumption in specific industrial applications – such as environmentally-conscious manufacturing – and also for entire segments of the economy.

In Technology for a Sustainable Future[1], the Administration has presented an integrated vision of long-term economic growth that creates jobs and protects the environment. Environmental technologies – ranging from clean energy sources to energy efficient manufacturing techniques to industrial processes that create new products from waste materials to the development and use of new energy efficient materials – are viewed as the means of helping industry shift from waste management to pollution prevention and efficient resource utilization, and a critical step toward implementing industrial ecology. This would enable companies to enhance their competitiveness by lowering energy and resource needs and reducing or eliminating waste disposal costs, and benefit the nation by reducing the environmental impact of economic activity.

The Department of Energy national laboratories should play a significant role – in collaboration with energy- and material-intensive industries – in the development of environmental technologies and an enhanced understanding of resource utilization in the economy. The concept of "industrial ecology" has begun to take root within the private sector as a way to examine energy and materials flows for industrial systems, products, and services, with the objective of providing a systems approach to designing environmental compatibility and sustainability of those systems. The scientific and technological capabilities needed to advance our understanding of energy and material use in the economy, in an industrial ecology framework, include:

- Energy supply, distribution, and end-use science and technology;
- Advanced manufacturing and process technologies;
- Materials science and technology;
- Environmental science and technology; and,
- Modeling and simulation of complex systems.

These capabilities are broadly resident in the Department's national laboratories and are already being applied to a number of projects that hold the potential for substantial improvements in resource utilization by various industrial sectors. For example, in the general area of manufacturing and process technology, projects at the ten laboratories amount to more than $100M/year in FY 1994.

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[1] Technology for a Sustainable Future, National Science and Technology Council, 1994

The Task Force believes that the laboratories could, and should, make a significant contribution to the integration of energy, raw materials, technology and environmental science throughout the nation's economy, and the development of the field of industrial ecology. However, at this point neither the Department or the laboratories are organized or managed to support this R&D area. Accordingly, we encourage the Department, working with the laboratories, to develop an integrated plan, based on the portfolio concept, for supporting this important area of research. We encourage the Department, as part of this effort, to establish an Industrial Ecology Advisory Board, including members from the laboratories, state, private industry, public interest groups and other government agencies.

We do not see this as a new mission area for the laboratories, but rather as an extension and integration of existing missions in energy and environmental quality. In fact, the Task Force believes that, without developing additional capabilities in environmental technology and industrial ecology, it will be difficult for the Department to carry out either its energy or its national security mission, such capabilities will augment and add value to the primary missions of the Department and laboratories, rather than being a new mission in itself. In addition, although the Task Force believes that there exists considerable potential within the laboratories to contribute to the development of environmental technology and industrial ecology, we recognize that R&D performers in academia, industry, and other government agencies also have significant roles. The level of support to the laboratories should be determined solely by the quality of performance and the comparative advantage of these institutions in addressing complex technical challenges involving energy and resource utilization.

3. General Observations About Laboratory Missions

Over the past two decades, several studies of the Department of Energy's laboratories have observed that these laboratories do not have clear mission assignments which would enable them to remain tightly focused on specific national priorities and programmatic goals. This Task Force found a continuing lack of mission-derived structure both within the individual national laboratories, and across the system of ten laboratories which were the subject of this review (although the phenomenon is less pronounced at the three weapons laboratories). The multi-program laboratories currently have self-generated mission descriptions which are so broad and generalized that they are essentially indistinguishable. As such, it appears that each laboratory is attempting to keep its options open in all fields of science and technology, which is compounding the problems of effective management. Researchers at the laboratories feel a sense of drift in no small part because the laboratories do not have sufficient focus or clarity of purpose.

The Task Force believes that diffuse mission assignments for the national laboratories may have been politically acceptable and fiscally affordable during the Cold War, but do not meet the political, budgetary, management, and programmatic needs of the present and future. At the same time, the Task Force recognizes that there are important and practical limitations on how narrow one can be in delineating missions for multi-program laboratories which exhibit vast breadth both in technical expertise and programmatic activities, and whose uniqueness in large degree derives from an ability to support complex, multi-disciplinary R&D activities. Such limits also stem from the inherent difficulty of assigning goal-oriented missions to institutions which perform a considerable amount of basic research – activities which the Task Force believes are essential for the nation, but for which the timing and nature of discoveries is fundamentally unknowable.

The Task Force did not elect to take on the task of suggesting specific areas of programmatic focus for each of the national laboratories. However, we do feel strongly that the Department and the laboratories -- working together -- must go much further than they have to-date in developing mission assignments for these laboratories which will balance both the strength of these institutions as multi-program laboratories with the need to provide greater strategic focus within a tight federal budget environment. Such mission descriptions, which should help guide funding decisions by the Department, should:

- Capture the primary focus or strategic thrust of each laboratory, while also identifying the two or three areas of secondary importance based on specialized capabilities;

- Reflect areas of distinctive competence;

- Provide the basis for organizational coherence and motivation; and

- Be sufficiently clear and specific to enable the development of goals against which performance can be evaluated.

The Task Force believes that the development of more refined mission statements for the laboratories, disciplined by Departmental budget decisions and strategic planning, will result – over time – in greater differentiation and specialization among these institutions. One mechanism for institutionalizing this specialization could be, for example, the creation of a number of "Centers of Excellence" within the laboratory system. This will have the beneficial affect of ensuring that the critical mass of programmatic focus in various mission areas will be secured within the confines of individual institutions, rather than being dispersed at sub-threshold levels across the entire system of laboratories. It also will provide the basis for programmatic consolidation and elimination of functional activities which are being performed better elsewhere in society.

The basis for public support of the national laboratories is: 1) that they are locations for centralized, generally large-scale R&D facilities that could not be maintained by academia or the private sector, and 2) they perform R&D for which there is a strong public purpose (e.g. national defense and complex, long-term research), and which for reasons such as market failures or other deficiencies in the national R&D infrastructure, the highest quality performance is through federal funding for these institutions. The basic mission of these laboratories should be to strive for quantum advances in our knowledge base, and to work with other R&D performers to transition such knowledge into applications that meet national needs. One of the great strengths of the multi-program laboratories derives from the diversity of technical expertise that can be brought to bear from within these laboratories on specific scientific and technical challenges. In recommending that more specific missions be assigned to the laboratories, therefore, the Task Force seeks not to force specialization that would fundamentally jeopardize the multi-attribute character of these institutions. Rather, the Task Force is responding to a fundamental fiscal reality that has forced corporations and universities alike to concentrate on areas of strength, and to divest from areas of mediocrity.

While the Task Force believes there is considerable value to ensuring a concentration of capabilities at common locations, we also recognize the value of competition in spurring innovation (i.e. the highest quality proposals, as determined by peer review processes, should be the ones that are funded--regardless of whether proposals to satisfy DOE mission assignments come from a DOE laboratory, university, or industry). However, to-date there seems to have been a pattern of spreading the wealth across the multi-laboratory system rather than concentrating resources at individual laboratories or specific Centers of Excellence.

The Task Force also recognizes that there is considerable potential in achieving greater coordination of R&D expertise across the lab complex. The national laboratories are equipped with the information technologies and the culture of communication via computer networks which could provide the basis for close programmatic integration. The Task Force believes that the goal of efficiency in utilization of the national laboratories mandates that these institutions be managed better as a system, and that complementary strengths be integrated to the extent possible through the establishment of "virtual laboratories" via computer networks and lead laboratory assignments. As the laboratories are given more discrete missions which result in enhanced R&D focus, the creation of "virtual laboratories" will be an important means for retaining complex, multi-disciplinary approaches to problem solving across the laboratory system.

B. Recommendations

1. *The Department should organize itself to achieve greater integration among its applied energy programs, between these programs and industry, and between the applied energy and basic energy research work performed at the laboratories*. The Department's applied energy work does not appear to be managed as a portfolio, rationalized and integrated under a common strategic framework; rather, it operates like disparate fiefdoms. Greater coordination could be achieved through planning efforts that apparently do not now exist.

2. *The integration of energy and environmental considerations should be a fundamental organizing principle for much of the Department's activities*. Energy production and use, environmental protection, and economic output are increasingly interrelated, and the Department--through its laboratories--have substantial technical resources to address these national needs in an integrated fashion. At the present time, however, neither the Department nor its laboratories are organized to meet the potential that the Task Force believes exists to further the development of environmental technologies that meet the shared needs of energy, environment, and the economy. The Department should continue and expand R&D partnership efforts between the laboratories and resource-intensive industries, utilizing the concept of industrial

ecology as a method for deriving outcomes that contribute to sustainable economic development. An Industrial Ecology Advisory Board should be established to support this effort.

3. *The Department and the national laboratories should move promptly to establish clear mission statements for the laboratories which will be utilized as tools for budget decisions and long-term strategic planning*. The process of establishing missions for the laboratories should be exploited as an opportunity to clarify the precise character of the world-class strengths within each of these institutions, as well as the areas which may be appropriate for downsizing, elimination, or consolidation elsewhere within the laboratory system.

4. *Mechanisms should be established to enhance the management of the multi-program laboratories as a system*. The Department should develop a means of breaking the existing pattern of laboratory management, which treats each lab as a conglomerate of hundreds of individual programs, and all of the laboratories as separate and distinct entities. Greater efforts should be taken to coordinate and integrate the complementary strengths of these institutions through communications networks. In addition, institutional arrangements should be established to facilitate joint planning by the full group of multi-program laboratory directors and senior Departmental officials.

5. *The Department should establish lead laboratories according to mission assignments and programmatic strengths*. The current management of programs by the Department from headquarters promotes the existing balkanized structure of program execution. Lead laboratory designations would vest substantial management responsibilities closer to where the work is performed, while leaving Departmental program managers with the job of focusing on research needs, mission success, and long-range strategic policy.

6. *The Department should establish Centers of Excellence within the laboratory system*. These should reflect specific high priority national and Department research needs, and can be either wholly within one laboratory, or a "virtual Center of Excellence," drawing upon the resources of several laboratories. In this way, specialization while retaining broad multidisciplinary capabilities can be encouraged.

IV. The Environmental Cleanup Role

A. Introduction

The Department of Energy's management of its program for dealing with the radioactive and hazardous wastes at its former nuclear weapons production sites and the national laboratories has been criticized for its expense and the slow pace of cleanup. The program is of great size and the problems that plague it, developed over decades, are acute and pervasive. Involving the national laboratories in more sweeping ways is an important part of a number of needed improvements.

B. Background

Disposal practices for radioactive and chemically hazardous wastes from the start of the Manhattan Project of World War II, excepting high level waste, consisted of shallow burial, of injection underground using deep or shallow wells, the use of cribs or settling ponds, or direct release to rivers or streams. Some of the Atomic Energy Commission's (AEC) practices resulted in the exposure of uninformed members of the general public to substantial levels of radiation and in later years there have been well-publicized leaks of toxic and radioactive materials.

Environmental concerns in the U.S. started rising in the 1950s, initiating a new era of citizen participation, and major changes, in environmental matters. Over three dozen pieces of Federal environmental legislation were enacted by the early 1990s. The AEC and later the DOE, did not move as U.S. industry did, maintaining that they were exempted from compliance with the bulk of U.S. environmental legislation.

Although beset by increasing discontent and criticism over its practices, DOE was slow to accommodate. It continued its old patterns of behavior until, in 1984, it lost a key lawsuit brought against it. Amendments to major pieces of Federal environmental legislation now explicitly require DOE compliance. The result has been to make DOE subject to the same array of Federal environmental standards that U.S. industry had already largely adapted to. The DOE found itself 10 years behind in Environmental Protection Agency (EPA) compliance.

In 1989, the Department announced that it would have all of its sites cleaned up by 2019. This same year it created the Office of Environmental Restoration and Waste Management (since renamed the Office of Environmental Management, or EM) to have responsibility for cleanup of the complex. The EM annual budget has risen from $1.6 billion in 1989 to $6.2 billion in 1994 and will exceed $7 billion when the Savannah River Site is transferred to it from Defense Programs. It has become the largest single item in the DOE 's $19 billion budget. It is the largest environmental restoration and waste management program in the world.

Driven by heightened public and Congressional concern, DOE established, in some haste, greatly enhanced requirements governing its own operations. It initiated major growth in the number and scope of environmental, safety and health regulations, nuclear safety regulations and DOE Orders. To ensure compliance, the number of audits, reviews and appraisals was increased dramatically.

DOE now has had to cope with the series of legal commitments to cleanup performance, with milestones and penalties for non-compliance, that it signed with state and federal bodies, for each of its sites. Inadequate attention was given by DOE to the feasibility of these commitments. One example was the Tri-Party Agreement at Hanford, signed by DOE, the EPA and the state of Washington's Department of Public Health. It mandates cleanup of the site by the year 2019.

The Department has been hindered by the press of Federal legislation and regulation by other Federal bodies. A dozen or more pieces of legislation all laid on DOE burdens with which it has been poorly equipped to deal. Moreover by the 1990s, all the states had their own environmental legislation, much of it binding on the Department and not always consistent with its Federal counterpart.

The Department also is hindered by lack of credibility and mistrust, not only on the part of community stakeholders but by Federal and state legislative and regulatory bodies. Some members of these bodies continue to disbelieve the Department, as well as many of its contractors, even when they are telling the truth.

C. Main Findings

1. Technical Challenges

The large quantities of radioactive and hazardous chemical waste that are at the center of concern exist in a broad variety of forms, toxicity, and storage or placement conditions. For the entire 3365 square miles of the DOE complex, now or formerly devoted to weapons-related activities there are, for example:

- 3700 contaminated sites, 500 facilities now surplus, 1000 more which will be declared surplus soon, and 5000 peripheral properties with soil contaminated by uranium mine tailings. DOE might declare as many as 7000 facilities surplus in coming decades, most of which would require cleanup prior to decommissioning.

- More than 330 underground storage tanks (including those at Hanford) containing 77 million gallons of high level radioactive waste as sludges or liquids.

- Waste volumes from weapons-related activities:

    - High Level Waste (HLW)385,000 cubic meters
    - Transuranic Waste (TRU)250,000 cubic meters

  - **Low Level Waste (LLW)2,500,000 cubic meters**
  - The LLW volume is equivalent to a cube nearly 0.1 mile on an edge which, if water, would weigh 2.8 million tons, if soil, some 8.4 million tons. The costs of disposal of low level radioactive waste (LLW) are currently in the vicinity of $5800 per cubic meter, for HLW as high as $6 million per cubic meter.

- More than one million 55 gallon drums or boxes of stored, hazardous, radioactive, or mixed (radioactive and chemically toxic) waste. An additional 3 million cubic meters of buried waste, much having breached containers, is mixed with soil underground.
- Over 100,000 gallons of plutonium and transuranic waste liquids having a high likelihood of causing environmental contamination and worker safety problems.
- More than 5700 individual "plumes," contaminating soil and groundwater, have been identified on DOE lands. For example, plumes of hazardous chemicals underlie about 150 square miles of the Hanford site.

2. Program Assessment

Two yardsticks are useful in judging the EM program: progress toward cleanup goals and the costs incurred, the latter related to the effectiveness of program management.

The remediation program has accomplished far less than many wish. The Government Accounting Office[1], in a recent review of management changes needed to improve applications of technology in the program, concluded that while "DOE has received about $23 billion for environmental management since 1989, .. little cleanup has resulted. Experts agree that many cleanup technologies in use are extremely costly and offer only short-term solutions." A May 1994 Congressional Budget Office (CBO) Study[2] noted that DOE "has been criticized for inefficiency and inaction in its cleanup efforts. ... [and] has been severely criticized because of the small amount of visible cleanup that has been accomplished." These conclusions are shared by many senior DOE personnel, both within and outside the program.

One of the consequences of the troubles has been the enhancement of a syndrome common to large bureaucracies: risk aversion. It has a name: "the Hanford Syndrome." It has become widespread and severe in the EM program. Its symptoms are an unwillingness to alter familiar behavior patterns, to stick with unproductive or failing procedures, to enhance tendencies for excessive resource allocation and regulation, and to oppose innovation. It is an important element in sustaining unproductive patterns of work.

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[1] "DOE Needs to Expand Use of Cleanup Technologies." GAO/RCED-94 - 9205 .

[2] "Cleaning Up The Department of Energy's Nuclear Weapons Complex," The Congress of the United States, Congressional Budget Office, Washington, DC. May 1994. This reference contains an extended discussion of DOE 's managerial practices, its approach to risk assessment and to the incorporation of new technologies on remediation efforts.

The Tri-Party Agreement at Hanford, and similar ones elsewhere, have proven to constitute major constraints on remediation progress because, in many instances, they are unrealistic, not having had proper input from those experienced in actual cleanup. The milestones they incorporate, along with penalties for noncompliance, force continued activities, some of which are make-work and should be abandoned. Other activities should be delayed or modified so as to await more effective and less costly technologies. Virtually no one believes the timetables are achievable and DOE has already been forced into renegotiations, as at Hanford in January 1994. Elsewhere DOE has been paying fines, owing to the Department's incapacity to meet deadlines, as at Rocky Flats where $27 million is now due for missing cleanup deadlines.

Probably the most important reason behind the slow pace of assessment and cleanup is the low quality of science and technology that is being applied in the field. Many of the methods, such as "pump and treat" for contaminated ground water remediation, cannot provide the claimed benefits. There is a lack of realization that many – and some experts believe most – existing remediation approaches are doomed to technical failure. Others would require unacceptable expenditures and much extended time to reach their stated objectives.

Over time, an increasing proportion of DOE resources has been going into DOE management in an attempt to lower environmental costs. The Congressional Budget Office report concluded that "at least 40% of the cleanup program's funds are devoted to administrative and support activities, a level that many reviewers have considered excessive. ...[they] represent a proportion that is significantly higher than the share spent by some other government agencies that may be performing similar tasks."[1]

DOE provides the most expensive environmental services of any government agency, with costs 40% above the average in the private sector. When DOE first became aware of these high costs, the Department's response was to try to lower them by an increase in management attention: it added between 1200 and 1600 Full Time Equivalents to its management and oversight personnel overseeing the remediation program.

How much the program will cost when and if completed cannot now be assessed with confidence. Estimates in the range $300 billion to $1 trillion have been made by DOE officials, but a lack of specific goals and achievable schedules as well as the absence of some critical remediation technologies make fixing the sum difficult. Some part of the facilities' contamination cannot be wholly cleaned-up; portions of the Hanford site, as well as others, will still be radioactive after many thousands of years.

D. Disconnects

One useful way of understanding the nature of the problems plaguing the DOE program is to look at "disconnects," potentially discordant sets of activities whose discord the

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[1] Ibid

Department has been incapable of harmonizing. There are disconnects in three areas of major importance to the EM program: (1) science/engineering and applications, (2) regulatory, oversight and compliance and (3) goals, objectives and means, the last involving the stakeholders affected by the program. These persistent disconnects have had numerous adverse consequences on the program.

1. Science/Engineering - Applications

There is a marked incapacity within the Department's EM program to evaluate current and prospective technologies in a wide-ranging and competent manner based on well-assessed risks. Without the resulting information it is not possible to introduce improved technologies into the applications stream or to modify or eliminate inefficient or ineffective ones. The gap between what might be applied and what is applied is well known within the program; it is called the "Valley of Death." In part it reflects the fact that there is inadequate communication between those attempting to remediate the contaminated sites and the research community that holds the key to identifying and readying advanced and powerful technologies.

One of the injurious consequences of the gap has been the failure to carry out a full program to characterize the waste remediation challenge across the many DOE sites: the nature of the risks presented by the diverse array of problem radioactivity and hazardous materials, the identification of applicable and available technologies to deal with them, as well as their limitations, and provide schedules, costs and expected effectiveness of reasonable and acceptable programs of remediation. The laboratories have not been tasked to perform such a characterization although they are well aware of its lack and have the technical capacity to carry it out.

The new-technology chain is seriously broken within DOE. There is little basic research being carried out relevant to the problems at hand and there is little rigorous analysis to learn from the experience in the field or from current tests. There is, for example, breakdown in communication and cooperation between organizational units within EM, from headquarters to field offices to sites. Technologies are being developed independent of field and site needs that are subsequently not field implemented because of a lack of customer interest or involvement or because they replicate work done elsewhere.

The root deficiency, which makes the science/engineering - applications disconnect a persistent problem, is the absence of a sustained, high-quality, scientific/technical review capability at a high level within DOE as well as a lack of leadership and poor management of the science/engineering - operational interface.

2. Regulatory - Oversight - Compliance: Management Disconnects

The host of self-inflicted, complex and frequently contradictory or redundant regulations and requirements that the laboratories and remediation efforts are subject to has become an enormous obstacle. Compliance can be quite burdensome, expensive and frequently fails to improve the affected activities. The influence of this disconnect is not confined to the EM program alone. It affects most every DOE activity, including those in both the multiprogram and the program-dedicated laboratories. Its consequences are greatest in the EM program simply because this program is DOE's largest.

In many circumstances there are harsh non-compliance provisions, and legal personal and civil penalties for failure. People are intimidated, afraid of going to jail, and this forces an excess conservatism, sometimes bordering on inaction. There is no dispute that this aggravates inherent tendencies toward risk aversion, a problem for other reasons, as noted earlier.

The managerial defects are discussed in the Appendix and are the subject of Section VII. That section should be considered an important adjunct to this present contribution for these defects have played an important role in causing and sustaining the problems in the EM program.

3. Goals - Objectives - Means: Stakeholders Interests

DOE has not set out to determine, in concert with affected stakeholders, the goals it should pursue, nor the standards to be met in the EM program. There is a disconnect with the customer base. Are waste-contaminated soils to be removed, remediated, left in place? What exactly is to be done to and with low-level waste? What to do about the large quantity of tritiated groundwater? What site conditions are the activities at Rocky Flats intended to achieve? No one is entirely sure. The January 1994 alterations to the Hanford Tri-Party Agreement were, in part, a consequence of some of these issues surfacing.

One result of the disconnect is too much attention to the immediate, acute problems, such as possible tank leaks, explosions, overheating, with relative neglect of longer range difficulties. The immediate matters can be serious, and must be dealt with, but the lack of a systems approach to the problems and their solutions, and thus lack of a synoptic view, means a poor priority list and provides bad choices. All of these elements lead to much ineffectual, albeit expensive activities.[1]

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[1] For example, after the forced shutdown of Rocky Flats, in the fall of 1989, acidic plutonium solutions were left in a half dozen tanks in one building, with concentrations up to 125 grams of plutonium per liter. They remain there to this day, with seals and gaskets deteriorating and occasional leaks occurring. It would have required 2 weeks to one month to process and eliminate the immediate risk. There is 70 miles of piping containing Pu-nitric acid solution with 30 kg of Pu in them.

E. The Future

1. Within DOE

A well-functioning EM program with clearly defined goals is surely within reach, given a Department commitment to move forward. The model that many refer to was the hugely successful Manhattan Project of World War II, with its exquisite blend of basic and applied science underlying a large production complex, based on previously unknown physical phenomena. From it emerged the testing, production and delivery of the weapons employed just at the end of the conflict. The scientific challenge today is less profound, the managerial ones more so. A crisp, well-defined program, fully utilizing national laboratory skills, could prove a model within the Department and for the nation on how to run a major enterprise. We now have a poignant situation, for technology known to senior scientists and engineers both in the national laboratories and in the country's universities is in the wings that, appropriately applied, could dramatically alter the current prospects.

2. The National Laboratories

Because the EM program so badly needs high quality science and engineering development, the national laboratories together have a critical role to play, a role very much larger than at present. The laboratories have unique resources and facilities and are accustomed to the complex, interdisciplinary blend of sciences and technologies that are the mark of large, technically-driven enterprises. They are really the only organizations that can pursue the large-scale basic research and development so badly needed to replace those conventional approaches that blight much of the current EM program. Industrial site-contractors cannot carry out such tasks effectively for much commitment to basic research puts the meeting of compliance deadlines at risk, dangerous in today's climate.

Most of the national laboratories confront large ranges of environmental problems on their own sites which, while regrettable, can serve as test beds for the development of a broad spectrum of improved remediation, waste minimization and cleanup technologies for application on far larger scales.

It may be important to designate lead laboratories for major programs to be established from among the laboratories to provide the synoptic view necessary to implementation of the scientific and technical studies and demonstrations necessary for a swift and efficient program. Most all of the national laboratories have important contributions to make to the EM program; a lead laboratory's role would be one of coordination and overall systems analysis and integration for a particular major effort. This does not mean assuming management responsibilities. The responsibilities fall to DOE management and its contractors and should remain there.

An additional benefit from designation of such lead laboratories is that they could become test beds for improvements in DOE regulatory and management practices and DOE Order compliance as well as for enhanced public participation. In brief, they can act as sites for valuable pilot programs, demonstrating the benefits of positive changes.

Formal institutional connections will be required with a number of other Federal bodies whose skills or whose regulatory authority relate to the tasks of the remediation program. These include the Environmental Protection Agency, the Department of Defense, the Bureau of Mines, and others. A lead laboratory is the natural place for much of this linkage to be coordinated. Here is where special regulatory provisions must be hammered out so as not to hobble research and development work unnecessarily. Constraints on environmentally injurious activities necessary to "production" cleanup and remediation efforts are not always appropriate to research, where special relief is often required and typically difficult or impossible to get.

The recommendation to create lead laboratories could well arise naturally, in the wake of other beneficial changes, but it might be well to anticipate its arrival. The first task of one lead laboratory would be to organize the long-missing characterization of the remediation challenge mentioned earlier. This must be carried out with stakeholder participation for reasons discussed above. It would be a major program as it would require the participation of many of the Department's laboratories and EM sites . Thoughtful options would then soon appear.

There are difficulties to organizing laboratory participation. One is the need to insure neutrality or to have a sure mechanism for dealing with real or perceived drift from neutrality. A second is the absolute need for strong leadership of the whole EM program. The lead laboratory cannot provide this leadership; it must come from above. Fortunately resolving the second difficulty would go a long way to resolving the first.

3. The Nation

One consequence of the activities of the United States' environmental movement is the massive environmental cleanup underway at numerous designated cleanup sites as well as at many other places in the nation. There are 60,000 EPA Superfund sites, 2400 Resource Conservation and Recovery Act (RCRA) sites, 22,00 state-funded sites, and 7200 DoD sites. The total U.S. cleanup bill is estimated to be about $1.7 Trillion dollars. The program is going slowly. "Of the $15 Billion that has already been spent on Superfund cleanups (across the nation), roughly 75% has gone to legal fees and related costs."[1] The need for more cost effective cleanup has already become an urgent matter.

Many of the problems are very similar to those that DOE faces. In particular DOD, EPA and others are struggling with the same technology and management issues as DOE. They will badly need the technical skills that a well-organized, technically competent DOE effort, with national laboratory help, could provide. For example, volatile organic compounds in arid and non-arid soils and ground water is one of the most common environmental problems in the US. Lawrence Livermore has already made important contributions to the technology of dealing with them.

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[1] Business Week, Aug. 2, 1993.

There is abundant evidence for the beneficial role the national laboratories could play in helping resolve national problems in the numerous advances that they have already made. Ocean-climate interactions are being modeled by Los Alamos in support of Global Climatic Change studies with similar global and regional atmospheric modeling at Lawrence Livermore National Laboratory. Many of the laboratories have made contributions in the areas of environmental damage and resource base assessment and diagnostics.

The Department must take positive steps to encourage this attractive opportunity. It will, among others actions, have to consider reducing its cost-recovery fees levied on all "Work for Others." These fees now signal that contributions to the tasks faced by other agencies of government are not a high priority with the Department. The national laboratories could look forward to being available to the entire government system as a powerful environmental technical resource, a great national need. They should become in fact, as well as in name, national laboratories, saving our nation significant resources and improving cleanup efficiency. If the national laboratories do not fill this role, there will be no satisfactory alternative, and the need will remain substantially unmet. In any event the experience base and the technological developments arising from the continuing EM program from the laboratories', industry's and research universities' contributions should be shared with the country on a continuing basis.

A broader vision sees the U.S. environmental and resource problems as a subset of many similar ones throughout the world. Science and technology must play a key role in coping with them. A strong DOE program could contribute at all levels. We are the nation best equipped to contribute solutions. Within the US, the Department of Energy marshals the best of these skills through its national laboratories and they could be put at the world's service.

F. Concluding Remarks

The Atomic Energy Commission, and for many years the Department of Energy, broke the unwritten contract between these arms of government and the people they were to serve. The results, contamination on an enormous scale and a bitter distrust, imply a deep obligation to carry through the cleanup that has now been launched, with efficiency, speed, and a decent respect for the opinions and needs of those affected. This cannot be accomplished as things are now. The changes required are clear; marshal the skills high in the DOE to bring about the managerial changes that are required; raise the quality of science and engineering in the program, among others things by utilizing adequately the great power available in the national laboratories as well as the power among DOE contractors and in the universities. The changes only need to be set in place and exploited.

G. Recommendations

1. *Sustained improvements in DOE management and leadership are needed both at senior levels in the Department and in positions below the Deputy Assistant Secretary level.* It is clear from the above material that those portions of the problems that DOE can control stem from managerial deficiencies at the top levels in the Department.

2. *A comprehensive remedy to the array of problems plaguing the EM program can only be achieved by a substantial commitment and high priority to address the challenges of this program*. These must originate high in the Department. It seems clear that this must occur at the Under Secretary level. This does not imply disassembling the present EM structure under an Assistant Secretary. It does mean a technically adept, flexible and perceptive management of that and related efforts within DOE that acts with power.

3. *Closing the science/engineering - applications disconnect should be dealt with by the establishment of an "Environmental Advisory Board (EAB)," reporting to the Under Secretary*. This should be a permanent Board and should include mostly scientists and engineers from within and without the Department and the laboratories, as well as stakeholders, to ease public acceptance of its recommendations. A good review capability could be provided by the EAB to identify needs so as to stimulate, with Department support, the required basic research, development and demonstrations. Such advances which should then be applied, by capable management, to improve field remediation activities. The Board must have influence and visibility in order to fulfill its role as an instrument of the Under Secretary. The High Energy Physics Advisory Panel (HEPAP) and the Nuclear Science Advisory Committee (NSAC) have such visibility, enhanced by their ability to give testimony to the Congress and their access to the Office of Science and Technology Policy. They are both widely believed to be quite successful. With members having a spread of skills, the Board should be able to provide technical oversight, flag management and regulatory disconnects as they arise and provide the synoptic view of the array of problems now lacking.

4. *The national laboratories together have a critical role to play, a role very much larger than at present, in performing high-quality science and engineering for the Environmental Management program*. Their principal contributions would be:

   - Help to characterize the waste remediation across the DOE complex as a first step in helping the Department establish priorities for environmental work.

   - Help communicate the technical challenges to the appropriate research communities.

   - Help close the "Valley of Death," by aiding the construction of a seamless technology development chain.

   The level of support necessary to implement major laboratory involvement as recommended here is small compared to the sums currently expended in the program. As an example, an increment of $400 million annually for the laboratories with a ramp-up over time to twice that sum is roughly the scale needed to pursue research and development in an improved program. In view of the large fraction of the nearly $7 billion annual EM budget that clearly is misspent now, we see no serious difficulty in redirecting funds that are already flowing. No supplemental money should be required.

5. *The Department must take positive steps to make the national laboratories available to the entire government system as a powerful environmental technical resource*. They should become in fact, as well as in name, national laboratories. The Department must take positive steps to encourage this attractive opportunity. It will, among others actions, have to drop, or greatly lower, its cost-recovery fees levied on "Work for Others."

6. *DOE must address more forcefully the task of renegotiating the unrealistic or unfeasible elements of the cleanup compliance agreements that it has made with State and Federal agencies*. These are now impediments from risk management, technical feasibility, and public perception standpoints as well as forcing large and fruitless expenditures. The Federal government's Superfund legislation also incorporates unrealistic goals; legislation in 1993, which failed to pass, addressed many of the issues which make many current remediation schemes impractical and expensive. The new Congress, as well as DOE, should revisit the issue, benefiting DOE's remediation efforts and other cleanup under Superfund.

7. *Much more comprehensive involvement by members of the affected public in decision making should be employed to reduce the bitterness, distrust and distress that continue to provide a troublesome element in DOE's conduct of its affairs*.

8. *The bulk of the EM environmental challenges, although presenting no immediate threats to public health or safety, still should be addressed with a heightened sense of urgency*. They have already been changing from acute to chronic problems, are becoming calcified, and the vast flow of funds into the program acts as an anesthetic, numbing the Department, State regulatory agencies and affected stakeholders, hindering and delaying beneficial change.

V. The Science-Engineering Role

A. Main Findings

The intense economic pressures now being experienced throughout the nation's research and development system will likely persist for the foreseeable future. This means that the nation must establish what is critical to be done and make sure that it is adequately funded. It also means that institutional effectiveness, including cost effectiveness, must be a paramount goal of national research and development policies. A prerequisite for achieving this is that there be a clear understanding of the relative strengths and distinct roles of the national laboratories, the research universities, and the industrial research laboratories so that an efficient division of labor can be made among them. We will comment on this in the context of industrial technology development in Section VI. Here we focus on DOE-sponsored fundamental research in science and engineering.

The Department of Energy is one of the principal Federal sponsors of basic research in the physical sciences. The Department has the responsibility to support fundamental science and engineering in areas relevant to its broad missions in national security, energy, and environment. Exercise of this responsibility requires a long-term and broad view of the areas of science that should be developed, as well as support for the education of the future scientific and engineering workforce of the United States in these fields. Historically, the DOE and its predecessor agencies have provided important financial resources for science and engineering education. They have also supported, as a national trust, certain areas of science involving the development, design and operation of large, complex user research facilities run for the benefit of the science community at large. These scientific, technological and educational activities have contributed both essential human resources and technologies to DOE's national security, environmental protection, and energy technology missions, and have also served the national interest in other domains.

DOE's spending on basic research is heavily weighted towards its own contractor-operated laboratories – including those considered in this study. These laboratories perform 67% of DOE-sponsored basic research, while the universities carry out 20%.[1,2]

For the laboratories reviewed here, basic research accounts for varying fractions of the overall research and development effort, ranging from 56% at Brookhaven National

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[1] National Science Board, Science and Engineering Indicators - 1993, Appendix 4-11, p. 346. The data referenced here are obtained from NSF-conducted surveys and should be interpreted with caution since DOE does not budget its research according to the categories used in the surveys. In reality, it is sometimes difficult to make the distinction between basic and applied research in those laboratories where the work is mainly applied R&D.

[2] The same preference for the laboratories is true of the DOE R&D budget as a whole. The majority (62%) of all DOE-sponsored research and development is done in the DOE laboratories, with most of the rest being done at the universities (9%), federal laboratories (8%) and industry (18%).

Laboratory to only 7% at Sandia National Laboratory. Overall, the laboratories devote about 19% of their combined R&D budget to basic research.[1]

Most laboratory directors believe that basic research is an essential part of their portfolio of activities. We agree with their arguments that basic research is necessary to support their core missions, that it is necessary to attract the most talented people to the laboratories, and that a strong in-house community of experimental and theoretical researchers is necessary to keep major experimental facilities healthy and organic. (As a rule of thumb, one laboratory director estimates that an internal community of first-rate experimentalists capable of successfully competing for 10-20% of the available machine time is necessary for this last function.)

Basic research at the DOE laboratories is under increasing pressure. In part this is the result of the same forces that are being brought to bear throughout the nation's R&D system. But there are several additional factors that are specific to the DOE laboratories: (1) a decline in the status of basic science within DOE; (2) an increasing trend towards micro-management of research by DOE program officers; (3) the potential diversion of funds away from basic research towards the new technology transfer activities; (4) the decline in defense R&D funds, which historically have been the traditional source of support for much of the basic science at the weapons laboratories; (5) inadequate up-front budgetary allowances for operation and maintenance of large user facilities; and (6) increasingly burdensome compliance requirements, especially at large scientific facilities, which are driving up laboratory operating budgets and reducing the amount of funding available for research.

The Task Force is concerned about what appears to have been a significant decline in DOE funding for fundamental research over the past three years, with the prospect of still deeper cuts to follow. The Task Force further notes that while these reductions have been occurring, overall support for basic research in the federal government as a whole has remained roughly constant or even increased somewhat.

The Task Force is also concerned that the distribution of DOE's basic research effort has failed to keep pace with recent changes in its mission. The Department is aware of the problem, and has instituted steps to address it. However, bureaucratic walls between program offices which contribute to the problem persist. As indicated in Section IV, there is a particular need for long-term, basic research in disciplines related to environmental cleanup. The activity that does exist in this area is poorly integrated into the cleanup program. By focusing too heavily on near-term demonstrations of cleanup technology, DOE is not using its laboratory capabilities effectively. The cleanup of DOE sites will not be accomplished in the near-term in any case, and in most situations there is no proximate danger to human life. Adopting a science-based approach that includes supporting development of technologies and expertise in universities as well as the laboratories could lead both to reduced cleanup costs and smaller environmental impacts at existing sites and to the development of a scientific foundation for advances in environmental technologies (see Section IV).

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[1] These data were obtained from the responses of nine laboratories to a survey questionnaire prepared on the Panel's behalf. (INEL did not respond to the survey but does very little basic research.) The survey used the same definition of 'basic research' that is used by the National Science Foundation: "The objective of basic research is to gain more complete understanding of the subject under study, without specific applications in mind. In industry, basic research is defined as research that advances scientific knowledge but does not have specific immediate objectives, although it may be in fields of present or potential commercial interest." An independent GAO survey of ten DOE laboratories found that 16% of their total R&D fell in the basic research category. The laboratories' responses to the Panel's and GAO's surveys indicate that they may see their R&D activity as more applied in nature than do the DOE respondents to the NSF survey referred to in a previous note. [Editor's note: A typographical error in the first printing reported the proportion of basic research at Sandia National Laboratories as only 0.7%]

Compared with the universities, the main strength of the DOE laboratories in basic research has generally been in building and overseeing the operation of large-scale, complex scientific facilities (light sources, neutron sources, accelerators, reactors, etc.). However, it should also be noted that not all facilities of this type have been located at the multiprogram laboratories, and that some, including some very large ones, have instead been placed at program-dedicated laboratories such as the Fermi National Accelerator Laboratory (FNAL), Stanford Linear Accelerator Center (SLAC), and the Princeton Plasma Physics Laboratory (PPPL).

The laboratories are also capable of forming large, interdisciplinary research teams needed for certain types of 'big science' problems even where large facilities are not involved. Universities are not generally as well equipped to assemble teams to conduct closely coordinated, multidisciplinary research over an extended period.

Compared with the government laboratories, the main advantages of conducting basic research at the universities lie in: (1) their primary role in educating the next generation of scientists and engineers; (2) the rejuvenating effects of the constant flow of students and post-docs through university labs; (3) the absence of national-security-related barriers to the flow of knowledge, (4) the lower price charged by the universities to sponsors for comparable research in many cases; and (5) the quality benefits provided by the systematic application of the principle of merit-based competition. Merit review is applied to basic research at the laboratories in a variety of ways, and sometimes unevenly.

The advantages enjoyed by the universities are most pronounced in 'small science.' However, the DOE Office of Basic Energy Sciences also supports some individual investigator research within the laboratories on a competitive basis. To varying degrees the laboratories themselves also support such research out of their operating budgets. This type of small science research at the national laboratories is generally of a high standard, and in some cases matches the best university work in the field. On the other hand, the research culture at many of the laboratories has been influenced by their relative physical and intellectual isolation and by a sense of entitlement to research funds, and this has contributed to a loss of vitality in some research areas.[1]

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[1] The panel attempted to determine in what proportions the different kinds of basic research described in the preceding paragraphs occur at the laboratories. According to the results of the survey carried out by the panel, basic research that is related to large user facilities accounts for 55% of all basic research at the laboratories; basic research that involves large interdisciplinary teams but that is unrelated to large user facilities accounts for another 34%; and general/single investigator basic research of the type most similar to university research accounts for the remaining 11%.

The third major category of basic research institutions, corporate scientific research laboratories, are being downsized, redirected towards activities with shorter-term commercial payoff, and in some cases dismantled altogether. Historically, research at these industrial laboratories has had a different character from either university or national laboratory research. While long-term and often fundamental in nature, it has also been shaped by knowledge of markets and motivated by expectations of commercial opportunity. And as two of our colleagues have pointed out elsewhere, 'the best of the industrial laboratories achieved a high degree of coherence of purpose and of organizational cohesion, which enhanced their productivity. And the larger enterprises could operate on a scale sufficient to employ experts across a broad range of relevant topics, facilitating work on many fronts."[1]

The nation presently faces the challenge of finding an institutional substitute for the corporate central research laboratories. However, we do not think that the national laboratories provide a good institutional basis for a general solution. Partly the problem is the one discussed in more detail in Section VI. If an organization is to serve as an effective laboratory for an industry, that industry must have a large say in allocation decisions and in evaluation. This would be awkward at best, and probably politically unviable, in a government-owned laboratory. But in addition, for a laboratory to perform the central research function effectively a considerable flow of personnel between the laboratory and the industry is required. University-affiliated facilities seem better adapted to meet portions of this need than government laboratories. In some cases, DOE laboratories may effectively be able to perform a function analogous to corporate central research. But these are most likely to be in areas where a DOE mission -- like advancing superconductivity technology -- and industry interests have a strong overlap.

B. Recommendations

1. *The Department of Energy should move to strengthen its efforts in fundamental science and engineering, both at the laboratories and in the universities*. The DOE has vital stewardship responsibilities in a range of basic science fields, especially in some areas of the physical sciences. Moreover, a strong foundation of science and engineering should underpin all of DOE's programmatic missions. The DOE should clearly define its basic science responsibilities, pursue them in a focused way, and ensure that adequate resources are available to do this.

2. *The DOE should pay close attention to ensuring that a proper balance is maintained between the universities and the national laboratories in the performance of DOE-related basic research, both now and in the future*. The laboratories are now and should remain an important part of the nation's research infrastructure, providing cutting-edge scientific instrumentation and operating world-class research facilities. But in the future the Department will need to ensure that the basic research and

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[1] Richard Nelson, Richard Rosenbloom, and William Spencer, "Shaping a New Era", November 1994 (DRAFT)

associated educational programs of the universities are not jeopardized by an exaggerated flow of federal basic research funds to the laboratories.

3. *Support for operating and maintaining large facilities in the DOE's Office of Energy Research should be budgeted separately from funds for specific programs* . This will provide better accountability and budgetary control, and will impose greater discipline on decisions requiring trade-offs to be made between investing in new facilities and keeping existing ones in service.

4. *The DOE should redouble its efforts to achieve better integration of basic research, technology development programs, and their applications, particularly in the area of environmental remediation*.

5. *Basic research at the laboratories should be more fully integrated into the national and international research community*. With the exception of national security-related work, all basic research at the laboratories should be subject to external merit review. Barriers that currently prevent laboratory personnel from traveling, participating in national and international conferences, and spending sabbaticals in industry or the universities should be eliminated. Further, to help promote the vitality of basic research at the laboratories, we recommend that DOE set aside small pools of basic research funds in the different programmatic areas for which university and laboratory researchers would compete.

6. *There should be additional stimulation of laboratory-university cooperation in basic research*. This can be achieved through measures such as having the laboratories support more graduate students, especially in mission-enhancing disciplines; creating more post-doctoral positions at the laboratories; arranging for university appointments for laboratory scientists and engineers; and setting aside funds to be used specifically for collaborative research between the universities and the laboratories. Barriers that make it difficult for the laboratories to jointly fund research at universities with other funding sources should be removed. Also, laboratory efforts to promote scientific education at all levels (kindergarten through graduate school) will benefit from being more closely coordinated with parallel efforts by colleges and universities.

VI. The Economic Role

A. Main Findings

The Task Force learned of significant examples of laboratory-developed technology being usefully transferred into industry and of the laboratories providing useful technical services to industry. However, the laboratories are not now, nor will they become, cornucopias of relevant technology for a broad range of industries. A significant fraction of the laboratories' industrial competitiveness activities concern technologies which are of less than primary importance to their industrial collaborators and/or which these partners could obtain from other sources. There are only a relatively few instances in which the laboratories have technology that is vital to industry and that is uniquely available at the laboratories. Many firms also find it attractive to collaborate with the laboratories because of the availability of Federal cost-sharing funds. In practice the government subsidy is often very substantial relative to the new resource commitments that the firms are making to these projects.

Taken as a whole, the industrial competitiveness activities at the national laboratories are unfocused and lack a firm policy foundation. There is uncertainty within the laboratories about how large and broad-ranging these activities ought to be, about how to fund them, and about how they should relate to the other main areas of activity that the laboratories are engaged in – in particular, whether industrial competitiveness should be viewed as a primary or a derivative function. The uncertainty within the laboratories partly reflects an inconstancy in DOE policy and Congressional intent regarding these issues. One of the options that the Department has considered, elevating industrial competitiveness to a primary objective or mission, risks distorting existing programs and diverting resources towards activities that are unrelated to either DOE's competencies or its other missions. Such activities are unlikely to produce results that will benefit either the agency's industrial partners or the public in the long run. Recent indications are that DOE headquarters staff have recognized the need for greater focus in this area and are moving to develop criteria toward that end. We welcome these developments and encourage early discussions of the evolving situation with laboratory leadership.

Another issue requiring clarification concerns the appropriate division of labor among the national laboratories, industrial research laboratories, and the research universities regarding industrial R&D. The notion that the national laboratories should serve as a "bridge" between the research universities and industry in this arena – a notion presented to the Task Force – is not in general a useful way to think about this division of labor. It does not reflect what is currently happening, it is not consistent with the fact of the research universities' superior record relative to the laboratories as agents of technology transfer, it is difficult to reconcile with any plausible view of the future evolution of these institutions, and it appears to be based on an outdated picture of industrial innovation as a linear process that originates in basic research laboratories.

A more useful picture is of the laboratories serving as nodes in a national network of research and development institutions, with knowledge flowing in both directions along the links between the laboratory, university, and firm nodes. This network is simultaneously pursuing fundamental knowledge for its own sake, innovation for the purposes of private wealth creation, and public missions (national defense, public health, environmental quality, etc.), while at the same time educating and training the next generation of scientists and engineers. Because it is a true network, each type of R&D institution is involved in some way in all of the network's activities, but there is specialization among them. While the national laboratories are one of the primary nodes for public missions like national security, their role in wealth-creating innovation is necessarily secondary (and probably even tertiary in sectors far removed from the DOE's mission areas). The question is whether, how, and to what extent they can add value to the primary role of industry in this arena.

1. The Case For Industrially-Relevant R&D At The Laboratories

There are two principal reasons why industrially-relevant R&D is seen as an appropriate activity for the DOE laboratories. First, long-term research and development in industrial laboratories is declining, and industry is seeking substitutes for the functions that these laboratories once performed. Second, there is a perception that the U.S. government is spending significant resources on the development of new technologies but that American industry is not reaping the rewards of that investment. In the course of pursuing the DOE missions, the laboratories have developed an impressive array of core competencies, capabilities, and facilities, and to many it seems only logical that these resources be used to benefit the public in other ways.

2. A Critical Distinction

However, what seems to have been lacking at both the DOE and laboratory levels is a clear understanding of the distinction between the application of laboratory-developed technologies to industries where such application is an essential part of the primary mission areas of DOE (e.g., the development of energy saving technology for industry use, or the development of methods for analyzing and predicting the behavior of nuclear waste repositories, or the development of advanced techniques for oil field simulation) and, on the other hand, the application of these technologies to industries which have not had a relationship with DOE and whose activities lie well outside the mission domains of the agency and its laboratories. Without a clear understanding of this important distinction, the risk is that DOE will allocate public funds and the technical and human resources embodied in the laboratories in unfruitful ways.

To clarify and sharpen this distinction, we have found it useful to categorize the range of possible laboratory activities in industrially-relevant R&D according to their position in the simple matrix shown in Figure 2. In practice the boundaries between the classes of activity shown in Figure 2 are imprecise, but the basic distinctions are important nonetheless. The four categories are as follows:

- Near-term R&D applied to industries outside traditional DOE mission areas (i.e., national security, energy, environmental remediation). To be effective, near-term R&D work must take place in an environment rich in interactions with users and customers. Market-based influence, direction, and control are critical to success. In recognition of this, firms themselves have been evolving towards a more integrated process for developing new technologies, in which all participating Departments and disciplines are drawn into close and continuing interaction with the marketplace. The more distant the laboratories are from the marketplace, the more remote the likelihood that they will have something useful to contribute to such activities. Near-term development work at the laboratories is least likely to provide substantial contributions to industries outside of DOE's traditional domains of national security, energy, and certain aspects of the environment.

	Within Traditional DOE Mission Areas*	**Outside Traditional DOE Mission Areas***
Near-Term Development	**Less Likely**	**Least Likely**
Longer-Term Research and Development	**More Likely**	**Less Likely**

National Security, Energy, and Environment

Figure 2 Expected DOE National Laboratory Contributions to Industrial Research and Development

- Longer-term R&D applied to industries outside traditional DOE mission areas. The potential contribution of longer-term laboratory research and development to commercial applications outside the DOE mission areas should similarly not be exaggerated. While there are instances of successful 'by-product' R&D, the historical evidence demonstrates that such events are statistically improbable. Even for longer-term development activity, strong interactions with the marketplace are usually essential to success. To provide industry benefits, such long-term R&D would need to be tied closely to groups of industries that have never had close association with the laboratories, their people, or their culture, an unlikely prospect for creating useful results. Moreover, to be useful in a different industrial context, substantial technological modifications are almost always necessary, so if the laboratories are engaged in such activity resources will inevitably be diverted from their primary missions.

- Longer-term R&D applied within traditional DOE mission domains. For firms and industries that are contributing to DOE's traditional mission objectives, the national laboratories have a useful role in carrying out long-term research and development with potential commercial applications. Indeed, it is even possible to imagine the laboratories playing a role with respect to these industries comparable to that which used to be played by central corporate research laboratories. Here the alignment between DOE and industry objectives is much closer by definition, and both DOE and its laboratories have more knowledge of their industrial partners' market environment. Longer-term research and development of this kind undertaken by the laboratories does not require day-to-day direction by industry, but close interactions are still important.

- Near-term development applied to traditional DOE mission domains. Firms and industries that are participating with DOE in pursuit of its traditional missions of national security/energy/environmental pollution control and remediation may become aware of technical developments at the laboratories that will help them in solving a short-term product or process development problem. In such cases industry should be an active partner in directing the course of development, and should be encouraged to transfer interim laboratory outcomes into its own internal industrial R&D programs through the appropriate licensing mechanisms.

3. Expansion Outside DOE Mission Areas

We are concerned about the implications of expanding the laboratories' industrial R&D activities outside the existing DOE mission areas. If the DOE is to get into programs whose primary mission is to meet a need of private industry (as contrasted with programs where private industry needs are complementary to government needs, but not dominant), private industry will need to have a large say in allocation decisions and in evaluation, since only industry has the intimate knowledge of the marketplace that is critical to the success of such efforts. The difficulty comes in reconciling this need for industry direction with the parallel need for public influence over the disposition of public resources at government laboratories.

We are also concerned that the expansion of the laboratories' roles in serving the technology needs of private enterprise will create additional managerial problems within DOE. For any organization to be effective, the activities it manages need to be associated with a coherent set of objectives. Otherwise, it is virtually impossible to allocate resources rationally, or to evaluate the various activities and programs in terms of how they contribute to the performance of the organization as a whole. This is amply borne out by experience in private enterprise which indicates that most conglomerates do badly, especially in managing technological innovation. Under statute, the DOE is faced with the considerable challenge of managing an already diverse set of missions. Adding to this complex task the requirement to consider the technology needs of the private sector in areas not related to the Department's traditional domain of activity is likely to distract DOE from its public missions and lessen its impact while undermining the effective pursuit of those industrial objectives. We are concerned that 'porkbarrel' criteria for program funding might increasingly replace more rational resource allocation, and that the laboratories might be more likely to propose industrial programs merely based on 'make work' criteria.

We are further concerned about the possibility that DOE and its laboratories, in engaging in industrial R&D, may find themselves competing with private firms in providing technical services or new technological developments. In such a situation, the laboratories' access to public funds would give them an inappropriate advantage. Such situations are more likely to arise the less DOE and laboratory management know about the commercial application in question. We are already aware of some instances in which such competition appears to have occurred, and we are concerned that the problem may become more serious in the future.

All of these problems can be ameliorated if the industrially-related R&D done by the laboratories is focused on industries and applications which are themselves instrumental to achieving the DOE's public missions. That is not to suggest that laboratory directors should be denied the flexibility to initiate new technical projects at the periphery of current activities. Making room for individual and small group initiatives of this kind is an important way to keep the laboratories lively and exciting places to work. If such a project becomes large enough, though, a judgment must be made as to its fit with the rest of the laboratory's activities. This will depend not only on technical compatibility but also on the project's relevance to the laboratory's (and hence the DOE's) missions.

The current industrial partnership activities of the laboratories have brought them into contact with a number of industries that do not lie within the Department of Energy's traditional domain. In addition to the drawbacks specified above, these new involvements also suffer from a number of other problems:

- They are unfocused. Without a connection to the Department's larger public missions, these initiatives are invariably add-on activities, managed on a case-by-case basis, through a well-intentioned but necessarily ad hoc relation to industry. The laboratories should not aspire to become research boutiques for industries.

- Their short-term benefits are often oversold. Even when useful results flow from these partnerships, the benefits to the participating firms generally will not be evident for some time, and are inherently difficult to measure.

- They distract the DOE and its laboratories from their public missions, diverting both intellectual and material resources.

4. Technology Partnership Mechanisms

Cooperative Research and Development Agreements (CRADAs) currently occupy pride of place among the array of mechanisms employed by DOE to encourage laboratory-industry cooperation in technology development and transfer. Introduced to the laboratories in 1989, the CRADA mechanism reflects the intent of Congress, developed and refined in legislation over the preceding decade, to ensure a greater degree of laboratory involvement in industrially relevant activities. Industry criticism of the CRADA mechanism has focused on the slow and uncertain nature of the negotiation process. The DOE and the laboratories have responded to these concerns. Nevertheless, there remain wide variations across the laboratory system in the speed with which CRADA negotiations are being concluded. Ironically, recent contractual reforms intended to encourage more businesslike relations between DOE and its management and operations (M&O) contractors at the laboratories risk complicating laboratory/industry negotiations because the contractors are more strongly motivated than before to secure rights and to take direct profits from laboratory-generated intellectual property. The Task Force believes that the contract-driven M&O motivation to profit from laboratory intellectual property will act as a significant barrier to industry acquisition and subsequent commercialization of laboratory technology in the future.

Other criticisms focus on the lack of independent review of the operation and outcomes of CRADAs[1], and also the process used to select industrial partners for these agreements. Regarding the latter, when a CRADA proposal is submitted there is typically no solicitation of competing proposals, nor an announcement that public resources are available for such work and will be awarded exclusively to the applicant company if others do not step forward. Nor is the peer review process as rigorous as other DOE programs; independent expert evaluations of the validity of the proposed work and its relevance to the DOE mission are not routinely solicited. These practices can be traced to earlier legislative and executive branch attempts to reorient the laboratories towards industrially relevant activities as rapidly as possible. However, their practical effect today is to leave the laboratories vulnerable to charges that the selection process is flawed and that the competitive playing field is being unfairly tilted towards the laboratories' chosen partners. In fact, DOE routinely and successfully implements several different models of independent peer review, at least two of which are relevant to the present situation -- the allocation of DOE beam line resources, and the allocation of funds under the Small Business Innovation Research (SBIR) program. The DOE should consider applying these practices to CRADAs as well.

5. Metrics

One of the most common metrics used by DOE and others to assess the technology transfer performance of the laboratories is the rate at which new CRADAs are being signed. An obvious limitation of this metric is that it measures inputs rather than outcomes, and the latter are likely to vary greatly from one CRADA to another. It also fails to distinguish among different classes of CRADAs. Some pertain to work that the laboratories would have undertaken anyway, even if no CRADA had been signed. Others entail a significant departure from a previous program of work. In some cases technology transfer activities have reportedly drawn the laboratories away from their primary missions. In others, resources appear to have been diverted away from fundamental research to support them. In such cases, a cost-benefit metric may be the only meaningful measure of performance. We also note that none of the laboratories appears to be measuring the effectiveness with which technology is being transferred in from industry or the universities to support their missions. In general, we recommend that greater emphasis be placed on outcomes in the measurement of technology transfer performance. The question of performance metrics for the laboratories in discussed further in Section VII of this report.

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[1] Post-CRADA follow-up work at the laboratories would be classified as 'work for others', for which the industrial partner is required to pay the full cost. Many industrial partners would at that point be inclined to pull the work back into their own facilities. Since the laboratories would then lose their DOE-budgeted CRADA financial resources, in the absence of independent review there might be a tendency for valid and successful CRADAs to continue beyond the completion of technology transfer and into product development or some other industrial activity.

B. Recommendations

1. *The government-funded technology transfer/industrial competitiveness activities of the national laboratories should be focused on industries and areas of technology that contribute directly to the DOE's primary missions in national security, energy and environment.* Industrial competitiveness, broadly defined, has no place as a stand-alone mission of the laboratories, but rather should be regarded, and treated, as a derivative of their primary missions. The idea that the laboratories are, or could become, cornucopias of relevant technology for a broad range of industries is a myth.

2. *Laboratory directors should have the flexibility to initiate or to approve new technical projects at the periphery of current laboratory activities*. But if these initiatives are unrelated or only tangentially related to the public missions of the DOE, either different sponsors should be found or the work should be spun off into the private sector once the level of activity exceeds what can reasonably be funded out of the laboratory director's limited discretionary account.

3. *Competitive selection and more rigorous technical and merit review by external experts should be applied broadly within the Department's CRADA activities*. There are several alternative models available to DOE for this purpose, including programs currently administered by the DOE itself. One strategy would be for DOE to link some portion of its SBIR programs to CRADA activities. The two programs have similar legislated commercialization objectives, which should make them compatible. In addition, making this linkage would help to achieve a higher commercialization rate by maximizing the available resources (both cash and in-kind R&D). Improvements in the CRADA selection and monitoring process need not, and should not, incur any penalty in the timeliness of the process. The DOE should continue to focus on reducing the time required to complete CRADA negotiations and on bringing the laboratory system as a whole up to the standard of best practice established by the leading laboratories.

VII. The Governance and Organization Issue

A. Introduction

In accepting its privileged assignment of suggesting alternate futures for ten Department of Energy laboratories, this Task Force could have limited itself to the conventional objective of most Federal advisory studies and only presented findings and proposals that might be adopted within the accepted governing processes of the times. But one critical finding is so much more fundamental than we anticipated that we could not in good conscience ignore it. The principle behind that finding is: Government ownership and operation of these laboratories does not work well.

The laboratories are purported to be contractor operated. The system is titled Government-Owned, Contractor-Operated or GOCO. The GOCO system was a promising concept. The Contractors, as contractors, do yeoman work. The system has been employed for decades. But in that time it has followed the natural course of government's proclivity to govern more. The owner wants to take charge more. Most able government personnel aspire to add value. Translation: add more governance. This makes work for more government personnel, increasing the size of the operation, increasing still further need for management, *ad infinitum*. Congressional policy has significantly driven this consequence.

Numerous instances of poor DOE regulatory and management practices have come to the attention of all members of the Task Force during its investigation of the national laboratories. The system has been tried long enough; the evidence is in. Today, the system has evolved to a virtual GOGO - Government-Owned, Government-Operated, but certainly strongly government-dominated system. And the momentum in that direction has been unabating. This "ship of state" (the Congress/Department/Contractor/Laboratory system) is ponderous. Evidence in these regards is almost limitless. Appendix A illustrates the excessive oversight and micromanaging with an abbreviated litany of some forty anecdotes. However, general areas of excess are:

- Growing emphasis on DOE administration and support organizations and their oversight and compliance roles;
- Expanded DOE field office management oversight roles, which are commonly duplicative of other management channels;
- Increased audit oversight and too many review groups, both internal and external. The increasing costs of dealing with review groups, both in resources and in their consumption both of senior and junior staff time, leads to paralysis and interferes with operations; and
- One array of difficulties with which DOE has not yet been able to deal properly is ironically self-inflicted. Far too much influence has been ceded to non-regulatory

advisory boards, such as the Defense Nuclear Facilities Safety Board. Such organizations generate recommendations with no apparent cost / benefit analysis, resulting in significant unnecessary expenditures and productivity losses.

As we were in the final stage of editing our report and preparing for submission, the Department initiated a Strategic Alignment effort to address some of these issues. The initiative is described in the announcement and explanation documents of the Department which were released on December 20, 1994. The Task Force applauds the Department's acknowledgment of the problem and many of its intended actions. The Task Force presumes no credit for this happening. Rather, we note that the establishment of this Task Force was itself an initiative of the Department a year earlier. The natural consequence was to put the governance issue into public play, and the Department has been responsive to the inevitable greater emphasis of this governance issue to its credit.

There is heartening evidence from inside the Washington Beltway regarding the suffocating consequences of micromanaging. It confirms our finding that something really substantial has to be done soon or the vitality of the laboratories will founder. But our evaluation of the seriousness of the problem and the limited promise of a continuing federal governance system even though partially muted, per the new Department proposals, is that efforts such as announced will be seriously insufficient.

It is the Task Force's position that top-down, command and control bureaucracies are counterproductive for these laboratories. Pundits may dismiss this reality. But if the laboratories are to optimally enhance America's energy interests, these are the realities of group dynamics essential for the laboratories to contribute their best.

Thus, our first operations recommendation is that we must begin to evolve, over a period of one or two years, the development and implementation of a new modus operandi of Federal support, based on a private sector style "corporatized" laboratory organization system. This proposal embraces the counterintuitive, yet newly-further-confirmed institutional principles that allow the subsets of an organization to operate more to the principles of trust and self initiative. From these principles accrue greater flexibility, quality, and productivity; as well as the revitalization of an operating institution and the heightened accomplishment of its mission.

There have been many studies of the Department of Energy laboratories. As one reads these reports, one recognizes that the items which were recommended in previous reports are for the most part recommended in most subsequent reports. As each past study has taken place, people of good intention do make sincere efforts to "fine tune" the system. However, the Department and the Congress should recognize that there has been little fundamental improvement as a function of past studies. In fact, the cost-benefit relationship of the Department/Laboratory operation has continued to degrade. If there is to be a significant benefit from this study, it will have to come as a function of a major organization and governance change.

We suggest that the country must try one or more concepts that are radically new in order to revitalize the laboratories and to achieve significant improvements. If some parts of a bold solution were to prove to be not as beneficial as this Task Force is confident that they would be, that unto itself should not be a matter of concern. The laboratories and the country would still be better off than they otherwise will be from the continual repetition of federal governing policies. The system is now so concerned with details that it cannot work the big picture.

Previous reviews of the laboratories have taken a top down approach. This one focused otherwise. Early on we invited the involvement of the people active in the system from the bottom up. It is evident to us that the competence is there in the laboratories to make these changes. Properly oriented and supported with quality management training, this inherent competence can make enormous changes in the productivity and effectiveness of the laboratories.

B. The Need to De-Federalize

The principal organizational recommendation of this Task Force is that the laboratories be as close to corporatized as is imaginable. We are convinced that simply fine tuning a policy or a mission, a project, or certain administrative functions will produce minimal benefits at best.

The government should be the customer of the laboratories. The Department itself should be an instrument of that customer function. The Department must become a world-class customer. World-class commercial customers do not tell their suppliers how to do things. They simply buy a result for a given price. World-class commercial suppliers are not audited by their customers. The commercial practice sets the quality of operations standards to which the government should commit.

The Task Force is aware that there are numerous laws on the books that specify that things should be done the way they are currently being done. The Task Force recommends that a clean sheet of paper be applied to the design of a new laboratory governance system by the Congress and the Department. The Task Force notes that over the years creative variations of government structures and funding have been flexibly initiated, including the Defense Advanced Research Projects Agency (DARPA, now ARPA) the Federal National Mortgage Corporation, Mitre Corporation, and many others. This precedent justifies the application of imaginative and practical forms and financing of organizations such as we propose, including the circumscribing of prescriptives, audits, and other overhead.

One attractive model that we outline here is the creation of a new not-for-profit R&D corporation or corporations, formed with many of the basic principles and criteria of a conventional commercial corporation. Although the DOE weapons-oriented laboratories could be omitted from the proposal outlined here, many if not all of the other DOE national laboratories at least are candidates to be included in this corporation. The not-for-profit corporation(s) will be governed by a Board of Trustees, consisting primarily of distinguished scientists and engineers and experienced senior executives from U.S. industry, appointed to staggered terms by the President of the United States. This Board will select the chief executive officer and other principal officers of the corporation. Each lab would similarly have a trustee advisory board elected by the parent board.

The Department of Energy will be the government sponsor of this new R&D entity. Initial funding of the corporation will be in the form of Congressional line items in the DOE budget in each of the four mission areas of national defense (if the weapons laboratories are included in the "corporation"), energy, basic research and environment; and another line item for "other programs," a miscellaneous category including health, facility improvement, global ecology, economic betterment, etc. Each of those missions will contain funding that can be used across the full R&D spectrum from basic research to development and technology demonstration. The budget should be for some multiple of years with our Task Force recommending that a decline be built into these funds over a five year period. Renewal of federal funding will be subject to Congressional approval.

Allocation of these funds among its several individual laboratories will be made by the corporation. The management of the corporation will deal with the traditional agencies for which the work is usually done in refining the allocations. Micromanaging or "earmarking" of these allocations should not be made by the Congress or the Department.

The corporation will be permitted to serve the particular needs of the Department of Defense, the Department of Energy, as well as any others in government, the universities and the private sector, just as any corporation would serve its customers. The corporation will be subject to normal commercial criteria of operation, including conventional outside auditors, as are required of other corporations. The corporation and its several laboratories will be subject to the normal influence and control of those agencies of the state and federal government that normally have authority over a United States corporation. If it wishes, the corporation may hire one or more contractors, similar to those now engaged by the DOE, to assist it with aspects of the management of its affairs.

The laboratories will be challenged to embrace the new higher standards of self initiated, self determined, quality service to customers that are being perfected in the private sector. As a result, the Department will receive more "bang for the buck". There is a spectrum of possibilities from which a new system of governance and operation can design the needed better way. Although we have outlined one specific embodiment of a corporate structure, many variations are possible. As mentioned above, the weapons-laboratories may or may not be included in such a "corporatizing," although some Task Force members feel including them would be both useful and successful. Various options also exist for ownership of the plants and facilities. For example, they may be leased to the corporation on a long-term or rolling basis, or they may be transferred outright. Combinations of operating plans can be staged in transition to a "far-less-federal" plan as a further possibility.

In this model, the DOE is the customer of the corporation. Funding for the corporation would be allocated to the DOE by Congress in a small number of broad blocks as described earlier. Allocation to specific projects would be the responsibility of the DOE, with no earmarking from Congress beyond quantifying the amount of money given to each broad block. Congress would indicate its level of satisfaction with the job the DOE was performing by increasing or decreasing the funding to each broad block. The DOE, in turn, would indicate its satisfaction with the job the corporation and its parts are performing by increasing or decreasing the level of funding for each project.

The contemporary official view is that the laboratories must conform to the so-called federal norm. The Task Force believes it is time to run a major experiment with a modest part of the federal budget and have the laboratories test out a progressive concept. The current annual budget of some $6 billion for these laboratories is modest compared to the entire government budget, or even the budget of many large corporations. At minimal risk, the country could experiment with a new way of doing things. It is just such quality of change that is renewing the rest of America to heightened achievements and increased competitiveness with resultant ability to achieve improved results with a smaller budget.

A compelling question is: what are the cost savings consequences of the change in governance and reorganization? Each time we tested the question on the players–those who work in the laboratories–the least called out was "10% savings"; to which most all other respondents would strenuously interject "40%," "25%," "50%," "20%." In private industry it is virtually axiomatic that a dedicated, empowered, quality program will generate better than 20% cost improvements with greater values in significantly improved quality of output of services, engineering and product.

As described in its Strategic Plan, the Department of Energy sincerely desires to be people oriented, to value creativity and innovation, to commit to excellence, to work in teams, to embrace leadership empowerment, and to pursue accountability. Regrettably, the fundamental system and structure under which it is obliged to operate cannot achieve the first five objectives to near the degree the Department leadership intends. The Department further recognizes that certain critical success factors are communications, trust, and human resources. Again, its hands are tied as it is obliged or elects to overadminister. The activities that it is obliged to direct and order are a countervention of the value of trust. The laboratory human resources are demotivated by such an environment.

The above are our recommendations of the type of substantial reorganization which could be expected to result in an improvement of between 20 and 50 percent in the effectiveness of the laboratories themselves, on top of significant staff and overhead economies in the Department. For example, under the proposed structure the present DOE Field Offices might have no role to play vis-à-vis the laboratories.

In implementing the proposed corporatization, a separate detailed identification of those services which only the government can provide as a supplier should be identified. One example may be the transportation of nuclear or other dangerous materials. These services could be purchased by the laboratories from the government.

Certain of the liability responsibilities that have been placed on the government's shoulders must be continued (at least relating to past government assignments, such as nuclear materials) absent bad faith and willful misconduct on the part of the laboratory corporations.

C. Other Subjects

1. Financial Resource Planning

The laboratories must have a reasonable predictability as to their financial resources. In this way, the people who work at the lab will be more secure in their professional futures, and will be further motivated to become the supremely productive entity to which they aspire. Some form of multiple year fund guarantees are essential. We must find a way under the "clean sheet of paper" doctrine of making this possible. We must further be willing to find ways of engaging cooperatively with foreign sources of funds for research and development, as such cooperative work will often multiply the effectiveness of the domestic work to our benefit.

2. The Laboratories As a System

One of the values of this Task Force process has caused the laboratories to come together as a system to a greater degree than they had been inclined or directed to do in the past. The laboratories could move to a virtual system, such as is described elsewhere in the report. This would be more readily accomplishable under Corporate structuring.

3. Technology Roadmaps[1]

The Task Force suggests that there be a more liberal application of the technique of defining technology roadmaps for those classes of technology which would yield to a roadmap. We urge that this management process be employed where practical. All appropriate constituencies from government, academia, industry and the laboratories who have a competence at contributing to a given roadmap, should be called upon to define such roadmaps in a manner similar to that which has been accomplished by the semiconductor industry.

4. The Globality Issue (vis-a-vis non-Defense technology)

These laboratory Corporations will be serving other private corporations. They must not be unduly inhibited by policies that restrict the use of the technology to American sites or to American personnel. This is a global energy economy and general economy. All users of knowledge must be able to use the knowledge, wherever that knowledge can best serve their customers. If that requires doing some further engineering or production overseas, such investments will do nothing but enhance the economic strength of America through exports and the lowering of trade barriers, with the eventual desired job creation at home. Some further liberalizing of the "design and manufacture only in America" must be effected.

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[1] A technological development plan which outlines, over time, the evolution of technological capabilities and provides milestones by which progress can be measured.

5. Metrics

At the onset of the Task Force study, a request was made to identify metrics of the laboratories' work. In no order of importance these can include: adherence to budgets, adherence to project schedules, patents filed, inventions disclosed, estimates of cost savings from a given potential application or actual application of technology, lists of technical problems solved, research dead ends now avoidable, the quantity and quality of research papers published, lab/university and lab/industry interactions as well as other collaborative work anecdotes, including CRADA results. The presently overused metric of "jobs expected to be produced from a CRADA" should be discouraged as speculative at best.

The degree to which a laboratory engages in the process of renewal would be a significant measurement. Science change, laboratories change, and laboratories' missions change. Laboratories such as Lawrence Livermore, for example, have changed over the last forty years having naturally gone from an 90 percent national security orientation to a 60 percent other class of activities orientation. Major projects like the Bevatron at Lawrence Berkeley Laboratory, which played an early important role, have been closed.

It is worth having metrics on how well the government is performing to make possible the better work of the laboratory and to expedite the application of certain of the output of the laboratories. For example, to what degree is the government becoming a better customer of the development, to what degree is it moderating regulations, to what degree is it making aid available tied to the development to encourage the commercial exploitation, to what degree is it making available low cost capital, what are the practical honorable ways of reducing the risks that would be borne by investors, how is the network of extensive testing facilities used to enhance and advance the application of products, how willing is the government to identify with the beginning success of a technology roadmap to support more vigorously extensions of achievements on that roadmap.

When all is said and done, the nature of the laboratories as a multidisciplinary system providing solutions to some of the truly challenging puzzle of nature, will require a qualitative evaluation more than anything else and a long time horizon to best measure the results.

6. Quality

The Department of Energy and most of the laboratories have embraced the language of quality management. They have studied the issue, they articulate the principles and they are educated on the fundamentals. The pursuit of these quality initiatives and the embracing of the practical methods and procedures of quality should produce values for the Department and the laboratories.

However, the likely end result will be limited because the principal authorities do not adequately appreciate a major way one improves quality: the elimination of functions. One must simplify procedures and get down to their essences, and the people in government are not prone to this. They administer quality in, control quality in, and audit quality in. Exactly the opposite is obliged. One cannot have a quality effect through the manner in which government imposes itself on the operations of the laboratory. We call for a true quality program. It must start at the top. It must start with the Congress and the Administration. When it starts there with proper respect for the essential principles, the ultimate result will require the government to "get out of the way" so that the laboratories can practice the quality principles that are practiced in the private sector.

Consider this excerpt from an article, "Why to go for Stretch Targets," in Fortune Magazine: "Finally – and here's where stretch targets differ from old-fashioned top-down management by fiat that U.S. companies have spent years unlearning – the CEO has to get out of the way. The job belongs to managers in the field, workers on the plant floor, and engineers in the labs." [1]

7. Facilities

There are superb facilities at the government laboratories. There are also facilities that have been allowed to languish. The insufficient attentiveness of the Department in keeping up the quality of existing facilities or the disposition of obsolete facilities is evident.

There should be a gradual reinvestment by the federal government in repairing research laboratories, and upgrading research instrumentation. Once that has been achieved after a period of years, the responsibility should be turned over to the laboratories. The laboratories should be expected to maintain and renew facilities in the same manner that the private sector is obliged to perform the updating, the tearing down and the construction of new facilities from their then aggregate budget assignments.

Elements of such a facility renewal plan should include:

- Facility consolidation, including decontamination, decommissioning and disposal of all non-essential structures and equipment.
- Upgrading all essential facilities to meet modern safety facilities.
- Initiate an enhanced maintenance program for all nuclear facilities bringing ongoing maintenance to appropriate industrial standards.

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[1] Fortune Magazine, November 14, 1994, pg. 146

- Complete and maintain all safety related documentation.

- The laboratories should see to the training of the work force to successfully implement and maintain safety and environment systems regarding such facility.

If we do not correct this facility situation, the cost of managing and maintaining facilities "today's way" will soon be so costly that it may substantially consume the laboratories' budget. If the full management responsibilities of the facilities are placed in the hands of the management of operations (that is, the laboratory directors responsible to their public trustees), we anticipate that the cost of facility maintenance will be significantly improved.

D. Recommendation

1. *Over a period of one to two years, the Department and Congress should develop and implement a new modus operandi of Federal support for the national laboratories, based on a private sector style -- "corporatized" -- laboratory system.*

VIII. Summary of Recommendations

For detailed versions of the following recommendations please refer to the body of the text.

A. National Security

1. The primary mission of the weapons laboratories must be a safe, secure and reliable nuclear stockpile in the absence of explosive testing. Science-based stockpile stewardship is the approach chosen be the Department to achieve this mission. It requires the following rank-order priorities:

   - Attracting and retaining skilled scientists, engineers, and managers over the years ahead with the expertise required for the complex and changing stewardship role;
   - Enhancing surveillance of weapons in the stock pile, during dismantlement, and of the nuclear materials that accumulate as a result of the dismantlement;
   - Continuing hydrodynamic testing to cope with problems;
   - Assessing problems, reanalyzing previous data through numerical simulations, and developing appropriate data bases; and
   - Sustaining the scientific process of inquiry through experimentation.

2. Non-proliferation, counter-proliferation, verification, and intelligence support have become a major mission along with stewardship of the nuclear stockpile. The Task Force notes that organizational compartmentalization within the Department complicates and makes difficult the appropriate inter-relationship and funding balance between support and non-proliferation, and recommends that the Department's organization reflect their importance and interdependence.

3. The Task Force believes Lawrence Livermore National Laboratory should retain enough nuclear weapons design competence and technology base to continue its activities in non-proliferation, counter-proliferation, verification, an intelligence support, to provide independent review for several years while alternative approaches to peer review are developed, and to participate in weapons relevant experiments on the National Ignition Facility (NIF). Lawrence Livermore National Laboratory would transfer as cost-efficiency allows over the next five years its activities in nuclear materials development and production to the other design laboratory. Lawrence Livermore National Laboratory would transfer direct stockpile support to the other weapons laboratories as the requirements of science-based stockpile stewardship, support of the DoD nuclear posture, and the status of the test bans allow.

4. The Task Force recommends continued funding support for the Dual-Axis Radiographic Hydrodynamic Testing (DARHT) facility; continued near-term support for the Los Alamos Neutron Scattering Experiment/Los Alamos Meson Physics Facility (LANSCE/LAMPF); continued pursuit of advanced computing, including computing through workstation networks; and proceeding with the National Ignition Facility (NIF) as a research facility, balanced with respect to other major investments.

5. The Task Force recommends that future production needs should be based on residual capabilities of Pantex, Los Alamos National Laboratory, and Sandia National Laboratories, and believes that no further investments in production capability are needed at this time.

B. Energy, Environment, and Related Sciences and Engineering Role

1. The Department should organize itself to achieve greater integration among its applied energy programs, between these programs and industry, and between the applied energy and basic energy research work performed at the laboratories.

2. The integration of energy and environmental considerations should be a fundamental organizing principle for much of the Department's activities.

3. The Department and the national laboratories should move promptly to establish clear mission statements for the laboratories which will be utilized as tools for budget decisions and long-term strategic planning.

4. Mechanisms should be established to enhance the management of the multi-program laboratories as a system.

5. The Department should establish lead laboratories according to mission assignments and programmatic strengths.

6. The Department should establish Centers of Excellence within the laboratory system.

C. Cleanup of Radioactive and Chemical Wastes

1. Sustained improvements in DOE management and leadership are needed both at senior levels in the Department and in positions below the Deputy Assistant Secretary level.

2. A comprehensive remedy to the array of problems plaguing the EM program can only be achieved by a substantial commitment and high priority addressing the challenges of this program.

3. Closing the science/engineering - applications disconnect should be dealt with by the establishment of an "Environmental Advisory Board (EAB)," reporting to the Under Secretary.

4. The national laboratories together have a critical role to play, a role very much larger than at present, in performing high-quality science and engineering for the Environmental Management program.

5. The Department must take positive steps to make the national laboratories available to the entire government system as a powerful environmental technical resource.

6. DOE must address more forcefully the task of renegotiating the unrealistic or unfeasible elements of the cleanup compliance agreements that it has made with State and Federal agencies.

7. Much more comprehensive involvement by members of the affected public in decision making should be employed to reduce the bitterness, distrust and distress that continues to provide a troublesome element in DOE's conduct of its affairs.

8. The bulk of the EM environmental challenges, although presenting no immediate threats to public health or safety, still should be addressed with a heightened sense of urgency.

D. Science-Engineering

1. The Department of Energy should move to strengthen its efforts in fundamental science and engineering, both at the laboratories and in the universities.

2. The DOE should pay close attention to ensuring that a proper balance is maintained between the universities and the national laboratories in the performance of DOE-related basic research, both now and in the future.

3. Support for operating and maintaining large facilities in the DOE's Office of Energy Research should be budgeted separately from funds for specific programs.

4. The DOE should redouble its efforts to achieve better integration of basic research, technology development programs, and their applications, particularly in the area of environmental remediation.

5. Basic research at the laboratories should be more fully integrated into the national and international research community.

6. There should be additional stimulation of laboratory-university cooperation in basic research.

E. Economic

1. The government-funded technology transfer/industrial competitiveness activities of the national laboratories should be focused on industries and areas of technology that contribute directly to the DOE's primary missions in national security, energy and environment.

2. Laboratory directors should have the flexibility to initiate or to approve new technical projects at the periphery of current laboratory activities.

3. Competitive selection and more rigorous technical and merit review by external experts should be applied broadly within the Department's CRADA activities.

F. Governance

1. Over a period of one to two years, the Department and Congress should develop and implement a new modus operandi of Federal support for the national laboratories, based on a private sector style – "corporatized" – laboratory system.

Appendices

Appendix A: Excessive Oversight And Micromanaging

The present structuring and operation of the laboratories is governed by the class of contracting: Government-Owned, Contractor-Operated (GOCO).

Were it possible to have a true government-owned, contractor-operated system it is conceivable that there could be a continuing activity under such a rubric. But wherever we turn we see evidence of nothing but a government owned and more government operated system.

As a function of the detail with which the Congress prescribes what should be done in the laboratories and the Congress's obsession with the issue of accountability, the Department is driven both to honor the prescriptions from Congress and to overprescribe in order not to be at risk of failing to be super attentive to the Congress's intentions.

The net effect is that thousands of people are engaged on the government payroll to oversee and prescribe tens of thousands of how-to functions. The laboratories must staff up or reallocate the resources of its people to be responsive to such myriads of directives; more and more of the science intended resources are having to be redirected to the phenomenon of accountability versus producing science and technology benefits.

This report could contain thousands of supportive pages from the thousands of involved people who unanimously complain of this phenomenon. We will merely illustrate with a few examples that could be multiplied were we to fully evidence this overaccountability practice.

The essence of our governance is to account for all the how-to's in contrast to "what" the laboratories contribute.

As a consequence the system is rife with:

- Hundreds of full-time equivalents are attending to issues per laboratory to see to the meeting of DOE requirements that are in excess of Federal, state and local regulations and/or are in excess of requirements for a comparable, commercial activity
- Hundreds of thousands of pages of budget information documents are prepared and circulated throughout the system. Many of the laboratories find themselves submitting their budget documents to well over one hundred offices.
- Department of Energy orders to the laboratories range from a few to a few hundred pages in length and are prescriptive to detail processes
- There are some 30 thousand individual requirements embodied in these orders to certain of the major laboratories

- Once an individual order has been determined as obliged to resolve a particular situation it is more often then spread universally throughout the system without any differentiation as to the uniqueness of the initial concern. For example an employee of a contractor only indirectly related to the principal work of a laboratory was involved in an automobile accident. This generated a prescription that all employees who drive their vehicle on laboratory affairs were obliged to take defensive driving lessons with the consumption of an inordinate number of hours and excessive dollars in unnecessary training costs.

- Auditors and inspectors often by the dozens descend often daily on many of the laboratories. The laboratories have to staff up to be responsive to the engagement and then are obliged to spend a significant amount of time putting in place whatever are the prescriptions of these auditors. Virtually every audit that was accounted to the Task Force added a cost, versus saved a cost.

- Almost everyone must follow new rules and orders not necessarily relevant to their situation, if perchance a few have erred elsewhere.

- DOE Headquarters has insisted that copies of DOE terms and conditions be attached to all file copies of literally thousands of small purchase orders in order to document that these terms and conditions had been transmitted to vendors.

- Procurement management directives have obliged the hiring of additional support staff, vastly increasing written procedures and hiring of procurement consultants.

- Construction projects and operational and equipment activities are to be managed to various different tracks of regulations complicating the common sense approach to resolving the particulars of such functions way beyond what other institutions in society bear.

- The capital asset management process and condition assessment survey is a hornet's nest of complex documentation without cost benefit consequences.

- Senior audit and inspection officials state that they must concentrate on reviewing and insisting on processes, audits, etc. because there is to them little demonstrated "product" against which to evaluate if the labs are producing a knowledge value for the money appropriated. Process is a surrogate of product.

- Department of Energy people report that many Congressmen believe that the Department of Energy should treat the oversight of employees of the private contractors just as if they were employees of the government.

- More controls are in the offing regarding overtime, pension costs and decisions regarding make or buy.

- From time to time the Congress or the Department allocates funds for a general research program and then put fences around what the money can be spent for.

- Congress and the Department often specify what it wants done but does not allocate the money for that new additional function.

- Funds are segmented to what are colloquially called "stove pipes" whereas the aggregation of funds would be far more effective and efficient allowing the people who know what the technology is all about to work out the allocations.

- Consortia are a recommended institutional way of the private sector interfacing with the laboratories. AMTEX (AMerican TEXtiles) is one such consortia. It took scores and scores of CRADAs to be written in order to have a relationship with the one consortia. Certain consortia that would want its work done most effectively in the laboratory system cannot get the work done in the appropriate laboratory.

- The system is input oriented versus output oriented.

- Each laboratory acknowledges that it has more people than it needs because of the Federal prescriptions and the inability to add the flexibility of assigning people in the manner that would be most productive.

- Environmental, safety and health objectives are worthy and all reasonable ones should be accomplished. The degree to which the Government is specifying how these are to be handled is beginning to absorb virtually as much funds as funds remaining for science.

- A laboratory wanted to outsource its cafeteria service. The Government obliged that the outsourcing of the 22 cafeteria workers required the laboratory to write a complete workforce restructuring plan, in spite of the fact that the authorizing act for such was intended to deal with fundamental structuring or changes in missions versus a minor change in a department. Incidentally, all of the 22 people would have been candidates to work for the outside supplier if that were to their and the supplier's best interest.

- Everyone wants in on the act--headquarters, the DOE area office, the DOE field office, program offices of the DOE, the Defense Nuclear Facilities Safety Board (DNFSB), the Department of Labor's office of Federal Contract Compliance, the EPA, the General Accounting Office (GAO) and the state where the lab is located. Each has oversight entities. Each thinks that their audit is the most important. Most audit without any coordination with others. Some audits take as long as six months. The number of auditors in an audit team vary greatly but has been as high as 150 people. The major financial impact of this is not the cost of the auditor's time but the cost and lost productivity of those interfacing with the auditors. This leads to an enormous escalation of cost. Possibly the greatest negative effect is the affect on the motivation of the scientists and engineers, all of whom are loyal to their science and loyal citizens wanting to be able peers with their respected associates in the laboratory. But we heard from any number of people the message that can be simply summarized that "more and more of us are more concerned about our job than doing the job." Too much time is distracted to the unpleasant and unproductive aspects of the job. An increasing number, though still a minority, lean to questioning the conditions of the job. Good people are leaving.

- The Department of Energy acknowledges that waste management and environmental remediation programs are the most rapidly growing Department of Energy demand on funds. To the extent that these obligations which derive from defense functions of decades ago could be more clearly segmented, the other major future interests including new science for environmental subjects, could stand alone.

- Starts and stops of assignments have caused an inordinate unproductive waste of funds. For example, the mesas around Los Alamos are strewn with the skeletons of facilities that were started with much enthusiasm on the part of the laboratory, the Department of Energy and Congress but were prematurely terminated before completion because the annual funding appropriation could not be sustained. Often these projects were more than 75 percent complete at the point of cancellation. The annual programming of funds is a major waste. Multiyear programming should in some fashion be accomplishable, providing the confidence of predictability.

- The very process of annually having to resell a program is an act of inefficiency.

- The total laboratory program (10 laboratories, $6 billion budget, 17 thousand active R&D personnel, etc.) is modest in size compared to many of the large corporations. Any corporation that you would compare this to would have but a small fraction of audit costs compared to what is involved in the oversight of the DOE laboratories. The laboratories are run by the same high quality class of honorable people (though they, like corporate people, make an occasional mistake or misallocation) and do not need to be overseen in the fashion that is prescribed. Those in the private sector rarely audit and inspect their suppliers' business processes, and for the most part no corporation allows any of its customers to audit and inspect its activities. The private sector does respect the laws that apply specifically to financial accounts, safety factors, etc., and the government laboratories should be limited to the same class of oversight.

- Recently the Department has been engaged in a sincere interest to improve the contracting process aimed at having the contracts be performance-based. Yet in the first major paragraph of the news announcement concerning performance-based management contracting, it says "the reforms would increase competition for DOE business, hold contractors more accountable for fines and penalties, reduce excessive outside attorney fees, require a specific performance criteria and measures on all contracts, impose stricter cost controls on expenses such as administrative support, maintenance, pensions, overtime and property management." The document that explains the performance-based contract is scores and scores of pages long.

- Page 46 of the contract explanation document indicates that the Department's current information system does not provide the kind of data needed to manage contractors effectively. The words convey: .the Department wants to manage.

- The document pleads the case that all the various contract administrators, inspector generals, audit agencies, etc. are under staffed and need more people.

- There has been an avalanche of DOE orders including 4,800 project orders and 8,400 Environment, Safety and Health (ES&H) orders with from 200-400 oversight reviews per lab per year.

- There are at least 12 principal layers of management between the assistant secretary for defense programs down through the layers of DOE and the laboratory program management to the bench scientist working of a project financed through defense programs. There are additional oversight and administrative chain of commands through the field offices which probably add two or three more layers.

- One array of difficulties with which DOE has not yet been able to deal properly is ironically self-inflicted. Far too much influence has been ceded to non-regulatory advisory boards, such as the Defense Nuclear Facilities Safety Board (DNFSB). Such organizations generate recommendations with no apparent cost / benefit analysis, resulting in significant unnecessary expenditures and productivity losses.

- There is neither a mechanism within DOE to evaluate and stand against poorly-taken DNFSB edicts nor to ensure Department-wide compliance with those edicts judged appropriate. The Board has itself noted this last defect.

- At Pacific Northwest Laboratory, for example, overhead costs of Environmental Safety and Health (ES&H) increased 40% over a four year period with no demonstrable improvement. A study of 13 DOE labs indicated that ES&H funding increased 100% and manpower increased 50% between 1985 and 1990. Safety performance was independent of funding and negative indicators (lost work days, radiation exposure, etc.) remained constant or increased.

- In many areas the regulations parallel rules already enforced by agencies outside of DOE under federal and state legislation. Frequently they prove unnecessarily stringent. As an example: Radiological control of radiation sources at Lawrence Livermore National Laboratory requires sources 100 times smaller than a Coleman lantern mantle and 300 times smaller than a smoke detector to be treated under the same standards as larger sources.

- EG&G, the management and operations (M&O) contractor at Rocky Flats, recently spent about $500,000 to write a record of decision to document that no further action was required to close out one of the Individual Hazardous Substance Sites (Operable Unit #16), mostly free of mixed waste contamination, where no further pumping or digging was needed.

- This was the result of an environmental gridlock involving the Comprehensive Environmental Response, Compenstation, and Liability Act (CERCLA), the Environmental Protection Agency (EPA) and the Colorado Dept. of Health, which DOE was unable to resolve.

- Requirements for maintaining the "safety envelope" at the Rocky Flats site, which among other matters involves 245,000 surveillances annually, preparing inspection reports and maintenance improvement records, costs the plant $100 million per year, a level that senior management considers "very unreasonable." Many staff members echo the desire for a clarification of goals for the site. Moreover while the delays mount, the experience base continues to degrade as seasoned employees retire or quit.

Appendix B: If GOCO System Is Obliged

If the authorities oblige that the GOCO system is retained, the Congress and the Department must improve operational efficiencies and motivational conditions of the federal system by correcting the policies and practices listed below. If these are not completely revised the Congress/Department/Laboratory system is destined to bear excessive unaffordable, micromanaging costs and demotivational consequences. It will follow that plan to deactivate and/or dispose of the laboratories at some liquidation value will be inevitable because the public will not countenance the high cost/low value output that will be destined.

Base DOE Oversight on Laboratories' Performance

- Replace compliance-based directives with simple, well-defined performance measures.
- Eliminate DOE approval of labs' internal procedure documents.
- Eliminate DOE approval of individual transactions (e.g., in procurement and compensation).
- Base audits and appraisals on serious risk.
- Eliminate duplication of audits, appraisals, and reviews.
- Reward success with decreased oversight.

Operate labs according to industry-wide regulatory standards

- Eliminate DOE self-regulation.
- Shift regulatory oversight and inspection functions to responsible federal agency.
- Eliminate these functions in DOE and reallocate resources.

Consolidate roles of DOE oversight offices

- Consolidate fragmented headquarters safety roles and responsibilities.
- Reduce vertical layering of responsibilities for general lab oversight.
    - Delegate oversight to one contracting office per lab, with a well-defined, limited scope of authority.
- Consolidate or eliminate field offices, at least.

Apply rational, consistent business management principles

- Institute a multiyear budget process, for both authorization and appropriation.
- Standardize DOE's budgeting and financial reporting requirements across program offices:
    - Offices have different criteria for schedule, format, type of budget data, or type of cost reporting.

  - Cross-cut budgeting should be examined for appropriateness.
- Empower labs to establish long-term supplier relationships.
- Empower labs to locally determine "color of money", except for Congressional mandates.

Manage lab infrastructure in a responsible fashion

- Re-establish a strong, well-defined landlord function, with one landlord per lab.
- Consolidate funding sources for infrastructure maintenance and improvement with each lab's DOE landlord.
- Initiate a multiyear "get well" program for labs' infrastructures.

Challenge labs to reduce costs

- Allow the quality management programs to become fully applied without outside interference.
- Strengthen overhead-control efforts.
- Outsource work based on good business practice for each site.
- Re-engineer administrative processes to fully exploit benefits of modern information systems.

Other

- Simplify CRADAs much more.

Appendix C: Terms of Reference

Terms of Reference
Secretary of Energy Advisory Board Task Force on Alternative Futures for the Department of Energy National Laboratories

Overview

The 1990s are a period of substantial change for the Department of Energy's (DOE) nine multi-program National Laboratories, particularly the Department's three nuclear weapons laboratories. Sweeping geopolitical changes, limitations on nuclear weapons testing, increased attention to economic competitiveness, and the continuing demands of energy development and environmental quality--all within the context of tight federal budgets--are but a few of the factors that confront the DOE laboratories with challenges and opportunities for the future.

The purpose for establishing the Advisory Board Task Force on Alternative Futures for the DOE Laboratories is to carefully examine options for change within these laboratories and to propose specific alternatives for directing the scientific and engineering resources of these institutions toward the economic, environmental, defense, scientific, and energy needs of the nation. The Task Force should focus its initial efforts on developing a comprehensive and current understanding of the facilities, resources, core competencies, activities, and missions of the Department's multi-program national laboratories, both as individual institutions and as a system. The Task Force should also develop an early understanding of the national defense requirements that necessarily will play a major role in shaping the configuration of the defense laboratories for years to come, and should closely examine the unprecedented recent growth in collaborations between DOE laboratories and the private sector.

Once a fundamental understanding of these matters has been established, the Task Force should broadly explore critical issues facing DOE's multiprogram laboratories (and single-program laboratories, as deemed appropriate) and should examine alternative scenarios for future utilization of these laboratories for meeting national missions. Among the alternative scenarios, the Task Force should specifically address options involving the possible redirection, restructuring, and/or closure of elements of the DOE laboratory system. The Task Force should identify the costs and benefits to the nation of various alternative futures for the DOE multiprogram laboratories, and within one year (January 1995) should report these assessments along with recommendations, as deemed appropriate.

Objectives

1. The Task Force should develop a clear understanding of the roles played by the DOE multi-program laboratories in the research and technology development process. Specifically, the Task Force should examine the roles of the laboratories in meeting public missions, in serving as an R&D provider to other agencies and the private sector, and in working with academia to advance fundamental science. This examination should include an assessment of the contribution of the DOE laboratory system to the overall national investment in science and technology, and a comparison of the activities of the DOE laboratories to the R&D focus of other government agencies, academia, and the private sector.

2. The Task Force should become well versed with the nuclear weapons-related research, development, testing, and evaluation (RDT&E) needs for the nation over the coming decade, and the options for satisfying these needs. Specifically, the Task Force should closely examine the strategic planning efforts currently underway within DOE Defense Programs, particularly those efforts aimed at shifting the nuclear weapons safeguards program from underground nuclear testing to science-based stockpile stewardship.

3. The Task Force should examine the current configuration of nuclear weapons RDT&E activities among Los Alamos National Laboratory, Livermore National Laboratory, and Sandia National Laboratories. This should include an assessment of the strategy behind the current configuration, which involves purposeful redundancy to promote competition and peer review. Alternatives to the existing configuration should be examined.

4. The Task Force should assess the role of the National Laboratories in supporting economic competitiveness and contributing to the U.S. industrial R&D base. This should include an examination of the opportunities and the mechanisms for the National Laboratories--as a system--to contribute to large partnerships with the private sector.

5. With a current assessment of the roles and missions of the DOE multiprogram laboratories in mind, the Task Force should examine several options for the future of these institutions in terms of budgets, management, and mission assignments, including an analysis of possible costs and benefits of each alternative. As part of the examination of costs and benefits, the Task Force should assess the ability of R&D institutions such as the DOE laboratories to adapt to varying levels of change. This analysis should assist the Task Force in recommending implementation options.

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Alternative Futures
for the
Department of Energy
National Laboratories

Volume II

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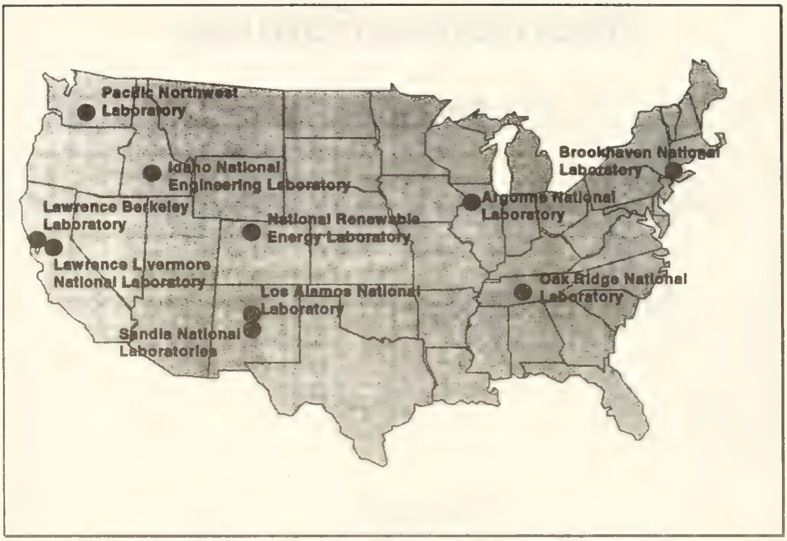
Pacific Northwest Laboratory
Idaho National Engineering Laboratory
Lawrence Berkeley Laboratory
Lawrence Livermore National Laboratory
National Renewable Energy Laboratory
Los Alamos National Laboratory
Sandia National Laboratories
Argonne National Laboratory
Brookhaven National Laboratory
Oak Ridge National Laboratory

Figure 1. Department of Energy National Laboratories Under Consideration by the Task Force

White Papers on the Department of Energy Laboratories

I. SERVING NATIONAL NEEDS: AN OVERVIEW OF THE DOE LABORATORIES 1
- A. Introduction 1
- B. Who We Are 3
- C. What We Do 5
- D. How We Do It 11
- E. Looking to the Future in a Changing World 16

II. DOE LAB CONTRIBUTIONS TO THE NATION'S SCIENTIFIC ENTERPRISE 19
- A. Introduction 19
- B. Science and Technology at the Department of Energy 20
- C. DOE Contributions to National Science Policy Goals 23

III. PEER REVIEW AT THE DEPARTMENT OF ENERGY 33
- A. Introduction 33
- B. Scope of Peer Review at the Department of Energy 34
- C. Current Peer Review Practices at the Department of Energy 37
- D. Comparisons with Other Federal Agencies 42
- E. Conclusions and Opportunities for Improvement 44
- F. Enhanced Application of Peer Review 45

IV. CORE TECHNICAL CAPABILITIES OF THE DOE LABORATORIES 53
- A. Introduction 53
- B. Core Technical Capabilities 53
- C. Guide to Core Technical Capability Data Charts 57
- D. The Ten National Laboratories Reviewed by the Galvin Task Force 59

I. Serving National Needs: An Overview of the DOE Laboratories

A. Introduction

The Department of Energy (DOE) manages the largest laboratory system of its kind in the world. With origins in the Manhattan Project, the DOE laboratories have evolved over the past 50 years to become a major component of the nation's infrastructure for maintaining U.S. leadership in scientific discovery and knowledge generation. Programs conducted at the Laboratories have consistently challenged our basic understanding of the world around us and driven new fields of scientific inquiry and technology development.

Contributions from the Laboratories in the future will help meet the National goals of environmental quality through clean energy sources and pollution-prevention technologies; enhanced security through continued reductions in the nuclear threat; continued leadership across the frontiers of scientific knowledge; and a growing economy fueled by technology innovations that open new markets, increase U.S. industrial competitiveness, and create high-skill, high-wage jobs for American workers.

The most valuable assets which the DOE Laboratories have brought to their mission assignments in the past -- and which will be dedicated to future missions -- are their human and physical resources. These assets are characterized by interdisciplinary teams with the skills to tackle national problems of great complexity and scope, and sophisticated and often unique scientific facilities that enable researchers to explore new scientific frontiers, to model and simulate processes and solutions to problems, and to achieve new understandings of how the world works and how technology can better address national needs. These resources have helped train generations of scientists and technologists who have carried the capabilities of the Laboratories to industry and academia.

Innovations and capabilities from the DOE Laboratories are behind innumerable technological achievements that have affected the nation's security, environmental quality, knowledge base, prosperity, and quality of life. Examples include:

- Development of the world's first nuclear explosive in a span of 28 months, from the date when the first scientists arrived at Los Alamos National Laboratory in 1942 until the first nuclear test in 1945. The scientists involved in this historic technological development are widely viewed to have been some of the most brilliant of the 20th Century. Their achievement required the collective efforts of physicists, chemists, mathematicians, metallurgists, engineers, and many other specialists -- a multi-disciplinary heritage which has been a hallmark of the Department of Energy laboratory system ever since.

- Development and continuous refinement of increasingly sophisticated computers. From the Univacs of the 1950's to the supercomputers of today, the Department's laboratories have been a test-bed for the first model of nearly every new top-end computer. Driven initially by defense and fusion applications, these systems now are employed at the laboratories for applications including global climate modeling; human genome research; designing next generation, fuel-efficient automobile engines; and modeling groundwater contamination.

- Technology breakthroughs in essentially all forms of energy sources and energy-efficiency technologies, including, for example, the original work on nuclear reactors; development of enhanced methodologies for oil and gas exploration; creation of new battery technologies for electric vehicles, new substrates for photovoltaic panels, and new energy-efficient window and building technologies; and advances in the development of fusion energy as a potential major future energy source.

- Original development of the field of medical isotope production and utilization. Laboratory research reactors currently are the sole source for californium-252, a radioisotope that has proven very effective in the treatment of certain cervical and brain cancers that are otherwise incurable. Other medical isotopes produced by Laboratory facilities are used for measuring bone loss in women (gadolinium-153), evaluation of coronary heart disease (potassium-43), treatment of prostate cancer (palladium-103), treatment of arthritis (tungsten/rhenium-188), and positron-emission tomography (germanium-68).

The scientists at the Department of Energy laboratories have served as invaluable consultants, experts, and hired researchers to the Government at-large throughout the past 50 years. For example, scientists of the DOE laboratories.

- Assisted the International Atomic Energy Agency with the physical inspections of Iraq's suspected nuclear and chemical weapons facilities.

- Provided a major advance to astronomical sciences with the design and prototype of the world's most powerful optical instrument, the Keck Telescope, which can peer 15 billion light years into space.

- Worked with the Department of Defense and United States intelligence agencies to determine possible sources of smuggled plutonium.

- Developed for the United States Army tank armor which achieved unheralded levels of survivability during the Persian Gulf war.

- Developed for the Department of Transportation a sophisticated computer model which can map commuter traffic to an unprecedented level of refinement, enabling new levels of transportation planning and air pollution studies.

- Developed for the United States Navy the nuclear reactors which have fueled U.S. ships and submarines for more than 100 million miles without an accident or a reactor failure.

These examples of laboratory activities illustrate the enormous variety of research underway within the confines of the Department of Energy laboratories. They also indicate the extent to which these laboratories truly are national assets -- serving national needs which extend far beyond the traditional mission boundaries of the Department of Energy. Although the Department of Energy laboratories had their origins in the Cold War, and their growth was fueled considerably by national security requirements, the resources of these facilities now are available for a much broader application to national needs. The existence of this national science and technology asset is one of the enduring legacies of the Cold War. Optimizing the utilization of these laboratories toward meeting the national security, energy, environmental, and economic needs of the future will be among the nation's major challenges -- and opportunities -- in the post Cold War world.

B. Who We Are

The Department of Energy laboratory system consists of 30 laboratories in 16 states, with combined budgets exceeding $6 billion and a scientific and technical staff which numbers close to 30,000. These facilities range from small, specialized laboratories with annual funding of less than $5 million per year, to large, diversified laboratories with annual operating budgets exceeding $1 billion. Nine of the major laboratories are "multi-program" laboratories, receiving funding from several different programs within the Department. Collectively, the laboratories are the major operational arm of the Department, performing much of the research and development which Congress directs the Department to perform through authorization and appropriations bills.

The Department of Energy Laboratories initially were established to direct the nation's efforts both in nuclear weapons and the peaceful use of nuclear energy, including nuclear power and later nuclear medicine. They also were given the mandate to support fundamental research in high energy and nuclear physics. In pursuing these objectives, the scientists and engineers at the National Laboratories explored scientific and technical boundaries across a range of disciplines, including materials science; advanced mathematical and computing techniques; frontier areas of physics, chemistry, health and environmental sciences, and geology; as well as newly emerging areas such as environmental impact assessments, systems analysis, and innovative engineering design. Today, the workforce of the National Laboratories displays a depth and breadth of scientific and technical competency found in very few institutions anywhere in the world.[1]

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[1] See Section IV "Core Technical Capabilities of the DOE Laboratories" for additional information on budgetary and workforce levels across the major technical competencies of the laboratories

The Department of Energy Laboratories are government-owned, but are operated by private contractors selected from industry, academia, and university consortia. This government-owned, contractor-operated (GOCO) approach to laboratory management began in the 1940's to meet pressing wartime needs, and today provides flexibility in the assignment of resources and facilitates quick responses to a wide variety of program needs. This approach enables private sector and university-based R&D management experience to be brought to bear on government work. The GOCO system has offered significant advantages in attracting and retaining world-class scientists and achieving scientific excellence.

In recent years, the GOCO system has been the subject of significant concerns regarding administrative and business management issues.[2] At the same time, however, there has been a growing recognition that the GOCO approach utilized by the Department of Energy had resulted in generally superior technical performance than is found at government-owned, government-operated (GOGO) facilities.[3]

The quality of scientific performance demonstrated at the Department of Energy laboratories can be measured in many ways, including numbers of technical accomplishments; scientific awards and peer recognition; patents, licenses, and commercialized technologies; and satisfied customers. In each of these areas, the success of the DOE Laboratories has been strongly validated. For example:

- Since the inception of the DOE Laboratory System, 31 scientists associated with the Laboratories have won Nobel prizes; of that number, 18 performed research as Laboratory staff and 13 employed Laboratory facilities in their award-winning discoveries.

- The Department of Energy has received more "R&D 100" awards than any other institution. This award is given annually to technology innovations (both from the public and private sectors) which hold a strong prospect for commercial success. Approximately 500 licenses are awarded annually for technologies developed at the Laboratories.

- More private sector companies seeking opportunities for technology development and research assistance are referred each year by the independent National Technology Transfer Center to the Department of Energy Laboratories than to any other federal institution.

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[2] In response to such concerns, the Department in 1993 launched a major contract reform initiative aimed at preserving the attributes of GOCO management while addressing acknowledged deficiencies which had been experienced primarily at the Department's GOCO weapons production facilities.

[3] The Defense Science Board in 1987 proposed that some of the Department of Defense laboratories be converted from government-owned, government-operated (GOGO) labs to GOCOs. The Office of Technology Assessment and National Academy of Sciences also have made recommendations that the GOCO model be seriously considered for DOD's laboratories.

- The Department of Energy laboratories perform more work for other federal agencies than does any other government laboratory system. The high volume of so-called "work for others" conducted by the Department of Energy laboratories -- nearly 20 percent of the entire funding which goes to the National Laboratories -- is a strong indication that the Department is successfully meeting the needs of other federal customers.

C. What We Do

The Department receives direction from Congress and the President to meet specific mission and programmatic objectives in areas ranging from alternative engine research to nuclear weapons dismantlement to nuclear waste clean-up to development of solar energy. Approximately 40 percent of the Department's overall $19 billion budget supports work performed at the Laboratories. The balance of the DOE budget supports researchers in academia, cost-shared research directly performed in industrial laboratories, the DOE weapons production/dismantlement complex, contractor support for environmental clean-up, the Energy Power Administration, and departmental operations.

Congress provides specific direction regarding how and where much of the Department's budget should be spent. In R&D areas, DOE program managers are responsible for establishing programs and determining where the best performance will be achieved for meeting programmatic goals in the Department's major mission areas of energy, basic science, national security, and environmental stewardship. Systematic planning and program reviews, including by independent advisory boards and peer review panels, serve as essential inputs for program development and funding decisions. Partnerships between the Laboratories and academic and industrial institutions are established as a means of helping meet the mutual goals of all parties. In addition, the Laboratories perform more than $1 billion in work for other government agencies.

1. Energy: Programs that Drive the Economy

The Department of Energy was formed, as a successor to the Atomic Energy Commission and the Energy Research and Development Administration, in response to the oil embargo and energy shortages of the 1970s. Contributing to the nation's energy security through creation of flexible, clean, efficient, and equitable energy supply and end-use technologies remains a major national challenge. U.S. consumers spend $450 billion annually on end-use energy commodities such as electricity, gasoline, and natural gas, and we spend $45 billion annually on imported oil. Although energy fuels growth, development, and improved standards of living, its use is one of the major contributors to the world's environmental problems, including urban air pollution, acid rain, and global climate change. As a result, environmentally-sound energy technologies such as renewables represent a major international need, one of the biggest emerging market opportunities worldwide, and thus a strong focus for the Department of Energy and its Laboratories.

The National Laboratories have contributed significantly to boosting energy efficiency performance of commercial and residential windows, lighting, and appliances; developing cleaner-burning fossil-fuel technologies; developing nuclear reactors and enhanced nuclear reactor safety; improving efficiency and reducing CFC emissions from air conditioning and refrigeration systems; heightening the efficiency and effectiveness of oil drilling and recovery operations; and reducing the energy necessary to make important industrial chemicals. Together, these advances are resulting in billions of dollars worth of energy savings annually. (see box) The DOE laboratories conduct about $800 million of energy technology R&D annually.

Energy Efficiency R&D Has Saved Billions

Since the mid-1970's, a cumulative $70 million investment by the Department of Energy in energy efficiency programs at Lawrence Berkeley Laboratory has helped to spawn a $2.5-billion annual U.S. market for four particular technologies and services: high efficiency windows, high-frequency fluorescent lamp ballasts; residential equipment efficiency standards; and computer tools for energy-efficient building design. As of 1993, this R&D investment has resulted in $6 billion in energy savings, an amount that will grow to $20 billion over their entire service life (with net return on investment for consumers of $10 billion). The advances in window technology drew upon a wide variety of Laboratory strengths as teams of research architects and thin film material scientists worked with physicists and engineers with an understanding of solar and indoor radiation, the reflective and adsorptive properties of materials, and the technology for manipulating these materials for enhanced performance.

2. Basic Research: World Leadership for Science, Mathematics and Engineering

The Department of Energy Laboratories have a rich science and technology base and a tradition of pursuing knowledge at the absolute frontiers of science. As a result, many major scientific accomplishments, from the subatomic to the cosmic scale, trace their roots to research conducted at the DOE National Laboratories. Large and unique world-class research facilities have enabled scientists to probe the fundamental building blocks of nature, decipher the forces of molecular biology, survey the surfaces of all forms of materials, and explore developments of the universe tracking back to the Big Bang.

Through the development and operation of particle accelerators for high-energy physics, the Laboratories have pioneered the development of powerful synchrotron radiation sources[4] for materials, chemical, and life sciences research. These facilities host large research programs involving thousands of academic, industrial, and government investigators. Research interests range from mapping the structure of materials' surfaces to visualizing the interior surfaces of arteries.

The Laboratories also operate facilities that utilize powerful beams of neutrons for studying materials such as the liquid crystals used in portable computer displays, metals and semiconductors used in electronics, industrial polymers, structural studies of biomolecules, and high-temperature superconductors. Virtually everything now known about certain vital characteristics of materials that are strong candidates for superconductivity comes from neutron scattering studies performed at the DOE Laboratories. These materials may revolutionize transportation and telecommunications.

Scientific inquiry at the Laboratories has proceeded along pathways that have resulted in developments that could never have been anticipated. Radioisotope separation science in the 1940s, for example, sparked the field of nuclear medicine, which today affects the lives of millions of people annually through cancer treatment and other radioisotope examination and treatment procedures. Studies into the causes and effects of radiation damage in reactor materials led to toughened structural ceramics for advanced diesel engines and gas turbines. And the combination of sophisticated computational capabilities and research in molecular biology at the Laboratories resulted in the development of the Human Genome program. This program has now grown into an international effort to map and sequence the entire human genome, which comprises three billion DNA base pairs. Deciphering the human genome, literally the blueprint for life, will provide unparalleled insight into the molecular basis of the thousands of genetic disorders that afflict humans -- providing the foundations for innovative medical diagnostics, genetic counseling, and ultimate mitigation of these disorders.

DOE laboratories have been instrumental in advancing entire fields of scientific research, including high energy and nuclear physics, plasma physics, nuclear medicine, nuclear engineering, supercomputing, and global climate research. Other examples include systems ecology founded on energy and nutrient studies using radiotracers, bioenergetics to trace the pathways of plant photosynthesis, and animal metabolism using related radiotracer techniques. The Department of Energy Laboratories perform approximately $3 billion in basic and applied R&D annually.

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[4] Synchrotron light sources utilize powerful beams of x-rays and ultraviolet radiation for conducting state-of-the-art structural studies. Synchrotron radiation initially was derived as a by-product of electron accelerators built for physics research. The results showed such high promise that later accelerators were built expressly to produce synchrotron radiation for materials research.

3. National Security: Reducing Nuclear Danger

National Security R&D in the Department of Energy is dedicated primarily to nuclear weapon activities, including:

- Science-based stewardship of the nuclear weapons stockpile;

- Support of nuclear weapon dismantlement and drawdown of U.S. and former Soviet stockpiles to their negotiated START II levels; and

- Development of technologies to help discourage and prevent the proliferation of weapons of mass destruction.

The nuclear weapons R&D program provides the science and technology infrastructure, including technical expertise and facilities, required to support a broad spectrum of DOE Defense Programs activities, which include design, engineering, prototyping, testing, and evaluation of nuclear weapons; supstockpile management; weapons dismantlement; arms control; and nonproliferation. Stockpile stewardship involves quality assessment and engineering, stockpile surveillance, and an independent nuclear safety assessment function.

Major thrusts in the nuclear weapons R&D program include: developing advanced predictive capabilities and above-ground experimentation facilities in light of the existing nuclear weapons test ban and developing advanced manufacturing technologies to provide a smaller and more efficient weapons production complex in response to decreasing defense budgets. These activities all rely upon the weapons R&D base, including a sustained competency in nuclear weapon design, for their successful accomplishment.

The three multiprogram defense laboratories work closely with DOE's production complex to design safe and efficient dismantlement processes. Automated processes using robotics and computer modeling are being developed by the laboratories to safely and cost-effectively handle the dismantlement of up to 2,000 weapons per year.

Assisting Russia and other former Soviet republics in reducing the size of their nuclear weapon stockpile is an important part of this activity. The laboratories are involved in several agreements with Russia for collaboration on the safety, security, and dismantlement of nuclear weapons of the former Soviet Union, and also assisting Russia in planning for the disposition of nuclear weapons-grade materials. Reducing the threat of nuclear weapon proliferation requires competence in nuclear technology and comprehensive and effective cognizance of international weapons developments.

The National Laboratories conduct some of the nation's premier research, development, and analysis for intelligence, proliferation detection, arms control, and verification technology. The Laboratories have developed instrumentation to verify compliance with the Limited Test Ban Treaty, the Nuclear Nonproliferation Treaty, the Intermediate Nuclear Forces Treaty, and the Strategic Arms Reduction Treaties (START). The Laboratories perform more than $2 billion in national security research and technology development directly for the Department of Energy, as well as nearly $1 billion in additional defense-related work for the Department of Defense.

4. Environment: Stewardship and Prevention of Waste

DOE is committed to cleaning up the environmental legacy of its past activities (mainly from the nuclear weapons program), preventing or minimizing new waste production, and assisting in the development of energy-efficient pollution prevention technologies for transportation and industrial applications.

Most of the actual cleanup work of environmental waste sites associated with the nuclear weapons production complex is conducted by private contractors, but the National Laboratories are actively involved in the technology development work necessary to help drive down the future costs of radioactive and chemical waste clean-up. Successes include radioactive waste isolation techniques, waste-shipment standards, and the use of genetically engineered organisms that consume waste or that emit light to show researchers when, where, and at what rate waste is being consumed.

Over the years, the labs have expanded their focus on waste clean-up and prevention to include broader environmental issues, such as nutrient cycling through various ecosystems, assessment of the acid-rain cycle, and examination of the effects of different types of power plants on the environment. The laboratories have worked on a range of technologies and manufacturing processes aimed at reducing or eliminating pollutants. Major accomplishments have been made in developing environmentally conscious manufacturing techniques for semiconductor manufacturing, including the development of a technique which enables companies to completely eliminate of the use of CFCs during semiconductor manufacturing. This development alone is expected to eliminate approximately 18,000 tons per year of CFC usage by the year 2010 and decrease energy use by 1.8 trillion Btu per year by the year 2010. The further development of technologies that integrate energy, environment, and economic considerations with the goal of contributing to sustainable economic development is a growing focus for laboratory activities. The Laboratories perform about $1.2 billion in environmental research and technology development annually.

5. Technology Partnerships: Enhancing National Competitiveness

During the past five years, spurred in large part by Congressional legislation adopted during the 1980s which promotes technology transfer[5], the National Laboratories have made considerable progress in teaming with industry in technology partnerships. During this period there has been a considerable evolution in thought about the role of the National Laboratories in contributing to economic competitiveness. Ten years ago, many in industry viewed the National Laboratories as "technology warehouses" that contained uncommercialized commodities ripe for transfer. Others saw the Laboratories as institutions that were inaccessible or had little to offer. These views often resulted in false expectations, disappointments, or missed opportunities.

Over the past several years, however, technology transfer has come to be characterized by a sophisticated set of partnerships between the Laboratories and industry, with clearly defined expectations and mutually-crafted R&D agendas. These partnerships have been growing at an unprecedented pace, with more than 1000 cooperative research and development agreements established between industry and the Laboratories during the past four years.

Through these partnerships, the Laboratories have begun to earn industry's trust, confidence, and support, and the Laboratories are acquiring new insight into the challenges faced by industry in technology maturation, product development, and manufacturability. As the next section describes, technology partnerships are not so much a mission area of the Laboratories, as they are a mode of operation. Increasingly, throughout the Laboratory system, partnerships with industry; academia; and state, local and other federal government agencies are the means of best meeting the research objectives established for the Laboratories. Through such partnerships, the expertise and resources of the Laboratories are teamed with those of other complementary institutions in a fashion that can shorten the time between basic scientific discoveries and product developments, and -- in the process -- strengthen the Nation's leadership position in economic growth, scientific advance, and technological innovation.

6. Science and Engineering Education and Training

The Laboratories offer a compelling environment and opportunity for helping educate and train students in science and engineering. Tens of thousands of students frequent the Laboratories annually for "hands-on" experiences that complement classroom education and contribute to the Nation's future supply of skilled scientists and technicians. The Laboratories sponsor post-doctoral fellowships and other research fellowships for hundreds of top-ranked graduate students annually, and many Laboratory personnel hold joint appointments at universities -- where they bring to their profession as educators the experiences drawn from their profession as government researchers. Through programs at all of the Laboratories, these National scientific assets are being put to use to assist in the education and training of students at the frontiers of science and technology. These facilities also have been used to help train thousands of teachers in the best techniques for presenting science and technology in the classroom.

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[5] The 1980 Stevenson-Wydler Act required the Department of Energy to establish technology transfer as an explicit mission of its laboratories. Subsequent amendments to that act, in the form of the 1986 Federal Technology Transfer Act and the 1989 National Competitiveness Technology Transfer Act, gave the Department and its Laboratories and facilities additional authority and mechanisms for working cooperatively with industry.

D. How We Do It

If there is one word that best describes how the Department of Energy laboratories execute their mission assignments, it is integration -- of scientists and engineers into multi-disciplinary teams; of basic science, applied science, and technology development into a holistic approach to problem-solving; and of complementary skills and perspectives from the federal government, academia, and the private sector to the mutual benefit of all parties. And if there is a single explanation for the ability of the laboratories to achieve such integration, it lies in the breadth and depth of core technical capabilities which form the set of skills which the laboratories exercise in pursuit of their mission assignments.

a) Scientific Facilities and Multi-disciplinary Workforce

By virtue of several decades of investment by the Nation in the Department of Energy laboratories, these institutions currently exhibit a combination of physical and human R&D assets not duplicated anywhere in the world. The replacement value of the physical R&D assets at these laboratories exceeds $30 billion, and includes facilities such as:

- One of the world's premier assemblages of high-performance computing centers, including many of the world's most powerful scientific computers, which serve as a fundamental tool for helping meet essentially all of the missions of the laboratories and which are setting the stage for broad utilization of massively-parallel computers in the future;

- The world's largest laser system, which is being utilized to simulate conditions within nuclear weapons, to advance our understanding of the universe, and to explore options for creating fusion energy;

- Two of the world's most powerful particle accelerators, which are being used to discern the fundamental building blocks of nature;

- Three of the nation's most sophisticated facilities for mapping the human genome;

- Three of the world's most powerful neutron sources (two reactors and one accelerator), which provide the means for materials characterization and medical isotope production, and environmental analysis;

- One of the world's leading tokamak reactors for studying fusion plasmas, which has produced the most power ever in controlled fusion energy experiments;

- Three of the world's premier X-ray radiation sources, which are being tapped for materials research in areas ranging from structural biology to designing integrated circuits to developing new industrial chemicals; and

- Major and unique facilities for studying combustion, solar thermal generation of electricity, photovoltaic cells, energy efficient lighting and window systems, nuclear reactor safety, energy utilization for construction materials and building technologies, and semiconductor reliability.

These are but a few examples of the research assets housed within the Department of Energy laboratories. Yet, even a partial listing such as this speaks volumes about the capacity of these labs to probe new frontiers of science, to work with industry in new areas of technology development, and to deliver scientific and technological progress in meeting important national needs. The full inventory of the major R&D assets at these labs would comprise a very long list, but in-and-of-itself would not paint a full picture of the means by which the Department and its laboratories execute their missions. This is because the facilities themselves are of little value without the trained workforce which, in many cases, designed and built the facilities, and which now operates them in the pursuit of scientific and technological advance.

The Department of Energy laboratories support an extraordinarily broad collection of scientists and engineers, with established -- and in many cases world-class -- expertise in areas including physics, chemistry, mathematics, computer science, engineering, materials science, biology, earth sciences, environmental science, metallurgy, and systems engineering. No other federal laboratory system has the ingredients of such a multi-disciplinary environment as exists within the Department of Energy laboratories, which is one of the reasons why these labs represent such a distinctive national asset.

b) Core Technical Capabilities

The facilities and trained workforce of the Laboratories can be presented in the context of eight major core technical capabilities, which together represent generic areas of expertise which enable the Laboratories to address their missions. These core technical capabilities are:

- Advanced Materials, Synthesis and Characterization
- Advanced Computing, Modeling and Simulation
- Advanced Manufacturing and Processes Technology
- Bioscience and Biotechnology

- Nuclear Science and Technology, High Energy and Nuclear Physics
- Advanced Energy Technologies and End Use Applications
- Environmental Science and Remediation Technology
- Integrated Defense Science and Technology

In addition to these major areas of expertise which are characteristic of the entire Laboratory system, individual laboratories within the system also have important and unique core capabilities, such as in laser and electro-optics, sensors and instrumentation, electronics, and neutron-based science. These additional strengths supplement the total resource represented by the Laboratory system. Each of these core capabilities depends upon multi-disciplinary skills drawn from the workforce of the Laboratories. Collectively, these capabilities provide the means by which the Laboratories solve complex problems assigned by the Department; respond to new challenges and requests for assistance from other government agencies, academia, and the private sector; and generally move ideas from concept to reality -- either through the generation of experimental results or development of new technologies and operational systems.

c) Integrated Approaches to Problem Solving

The combination of a pervasive problem-solving culture at the Laboratories, and the broad and diverse technical skills and core capabilities resident within the Laboratories, provide the ability for these institutions to address national issues in an integrated fashion -- through multi-disciplinary teams; through integration of basic science, applied science, and technology development; and through collaborative efforts with researchers from academia, industry, and other government agencies.

The Laboratories are at their best in bringing teams together to address large, complex problems. Because the Laboratories are organized to solve problems in a fashion that is unconstrained by the boundaries of traditional academic disciplines, they have a multi-disciplinary operational approach that is distinctive from the single-discipline methodology which remains generally characteristic of academia. In addition, because many of the problems assigned to the Laboratories are of a high-risk, long-term nature, the Laboratories generally have a different orientation than found in industrial laboratories, where near-term market forces are of paramount consideration. Yet, the Laboratories, because of their unique human and physical assets, have served as a catalyst for developing teams of government, academic, and industrial researchers. In this fashion, complementary strengths of researchers from varying perspectives are brought to bear on problems of common interest. Examples of integrated approaches to problem solving include:

- ***National Oil Technology Partnership:*** This effort involves all nine multi-program laboratories in partnership with the petroleum industry. Nineteen projects currently are underway in such diverse areas as seismic fracture detection, synthetic diamond drill bit development, and failure analysis of extraction devices. This partnership spawned an entirely new market in diamond drill bits and has yielded tens of millions of dollars in savings to petroleum companies.

- ***The American Textiles (AMTEX) Partnership:*** This effort involves ten of the Departmental Laboratories and a consortium of five nonprofit research, education, and technology transfer institutions representing the vertically-integrated American textile industry. The projects involve Laboratory strengths in advanced materials and processes, energy efficiency, waste minimization, information systems, and automation, in an effort to improve the competitiveness of the U.S. textile industry, from fiber through finished product.

- ***The U.S. Advanced Battery Consortium (USABC):*** This effort links the Department of Energy Laboratories, the "Big Three" automobile manufacturers, and the utility-supported Electric Power Research Institute, for the purpose of developing advanced batteries for electric vehicles that will both perform like present internal-combustion engine vehicles and satisfy various state mandates for zero-emission vehicles. This cost-shared partnership takes advantage of Laboratory strengths in advanced materials, energy systems, manufacturing, and diagnostics.[6]

- ***National Center for Advanced Information Components Manufacturing:*** This partnership involves the Advanced Research Projects Agency of the Department of Defense, the Department of Energy, and industry in the development of advanced electronics technologies, such as flat-panel displays. The effort draws on Laboratory strengths in manufacturing, computation and simulation, and electronics. Funding for the Center is provided by ARPA and supports research teams from the Laboratories, industry and academia.

- ***The PHENIX Detector:*** This large, nuclear physics detector will serve as a central data-gathering instrument for a major new particle accelerator at the Brookhaven National Laboratory. Construction of the detector involves approximately 360 scientists and engineers located at five Department of Energy Laboratories, 15 U.S. universities, and 21 foreign institutions and universities. This detector will examine nuclear matter which will be at some of the most extreme conditions of temperature and density ever achieved in a laboratory -- conditions that probably have not existed in the universe since the Big Bang. Construction of PHENIX draws on Laboratory strengths in nuclear physics; the design, development, and construction of large-scale research facilities; systems engineering; sensors and instrumentation; and advanced computation, modeling, and simulation.

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[6] The Laboratories also are major players, in collaboration with the "Big Three" auto manufacturers and other agencies, in the Partnership for New Generation Vehicles, an R&D effort aimed at developing a new generation of vehicles that will be three times more energy-efficient than today's cars.

- ***Superconductivity Partnership Initiative:*** This joint Department of Energy-industry effort, involving research centers at three of the Laboratories, has helped pioneer the fabrication and application of new high-temperature superconducting materials. Such materials, which conduct electricity with minimal resistance, hold the potential for widespread applications in areas ranging from appliances and electronic devices to medical imaging to power transmission and magnetic energy storage. Drawing on Laboratory expertise in advanced materials and processing, energy systems, advanced computing, and condensed matter physics, the centers are playing an important role in keeping U.S. industry competitive in the global race to develop superconductivity technology.

- ***Atmospheric Radiation Measurement Program:*** This DOE Program integrates the resources of eight DOE labs, 13 other federal laboratories, more than 20 leading research universities, and foreign and private enterprises to address critical elements of the United States Global Change Research Program. Research focuses on atmospheric radiative processes and the role of clouds, which are among the most critical needs for the improvement of climate prediction models identified by the National program. This major collaboration is resulting in a new understanding of basic climate processes and of the effects of climate on ecosystems and the evolution of natural weather systems.

These examples provide a snapshot of how the Laboratories approach problem solving through a distinguishing integration of skills, capabilities, technologies, facilities, and research performers -- including partners from throughout the Laboratory system, other federal agencies, industry, academia, and around the world. The extent of coordination, integration, and engagement between the Department of Energy Laboratories and other research performers also is illustrated by the following statistics:

- During 1993, the 60 major research and user facilities operated at the Department of Energy Laboratories were utilized by more than 9,700 scientists and engineers, representing 188 U.S. colleges and universities, 103 U.S companies, and 26 U.S. laboratories.

- During 1993, more than 20,000 scientists and engineers from industry, academia, and other government agencies worked as guest researchers at the nine multi-program National Laboratories.

- During 1993, the nine multi-program National Laboratories received more than 170,000 visitors, who frequented the laboratories for purposes such as briefings, technical discussions, and meetings.

- During 1992, the Department of Energy Laboratories had formal technology transfer partnership arrangements with more than 3,400 companies and academic institutions.[7]

- During the past four years, the Department of Energy Laboratories have entered into more than 1,000 Cooperative Research and Development Agreements (CRADAs) with more than 700 companies; the combined cost-shared value of these cooperative R&D programs exceeds $1.9 billion.

From fundamental and applied research, through design and development of applications, to process engineering and manufacturing support, the laboratories are an environment where all aspects of technology development and deployment are routinely addressed. The ability to integrate across the suite of capabilities at the laboratories explains why these institutions have become magnets for such a large number of academic and industrial researchers.

E. Looking to the Future in a Changing World

The nation faces major new challenges as a result of the end of the Cold War, growing concerns about U.S. economic competitiveness, the need to achieve sustainable economic growth and environmental quality, and the reality of stringent federal budgets. As a result of these forces, the national scientific and technological enterprise is experiencing perhaps its most significant transformation since the end of World War II. Industry increasingly is looking for opportunities to team with other R&D performers -- including former competitors -- in the development of new technologies; there is growing political pressure for all public investments to be tied more closely to national needs; the principles of total quality management increasingly are being applied throughout industry, including at research institutions; and the traditional boundaries between federal R&D agencies are giving way as the Nation seeks to provide multi-agency, coordinated approaches to satisfying National needs.[8]

Faced with these new circumstances, the Department of Energy Laboratories are changing dramatically. The defense programs at the Laboratories are undergoing a complete transformation. Partnerships between the Laboratories and industry are growing at an unprecedented pace, far exceeding available funding. The Department has instituted new contract reform measures aimed at improving management of the

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[7] These arrangements included cost-shared contracts, cooperative research and development agreements, R&D consortia, personnel exchange programs, licensing agreements, user facility agreements, and consulting agreements.

[8] The President's Science Advisor has referred to the establishment of a "virtual R&D agency," which involves utilization of the full spectrum of federal R&D capabilities in an integrated and coordinated fashion, facilitated by the National Science and Technology Council.

Laboratories. In addition, the Laboratories are working more closely together as a system than at any time in the past and are forging strong new relationships with other government agencies. These changes all suggest a general direction for the future of the Laboratories. Although the precise research agenda will emerge and evolve with time, the focus for the Laboratories in the future will be on helping meet major National needs for which science and technology play a role. The challenges include:

- ***Providing Energy Resources:*** Global population growth and expected increases in energy utilization, particularly in developing nations, create both challenges to the environment and opportunities for the provision of clean energy sources to world markets. The potential risks of global climate change will demand continued technical advances in areas such as sustainable energy technologies; efficiency improvements for fossil fuel combustion; and energy-efficient materials, manufacturing processes, and transportation systems. The development of fusion energy, hydrogen energy, and options for advanced nuclear power all must be explored as part of a National program to provide secure, reliable, and diverse energy for the future.

- ***Reducing the Nuclear Danger:*** The end of the Cold War has provided an historic opportunity to reduce global nuclear weapons stockpiles, yet the nuclear danger persists due to nuclear proliferation, potential terrorist actions, and significant quantities of weapons-grade materials and the know-how to build nuclear devices. The United States will continue to rely upon nuclear weapons for deterrence for the foreseeable future, yet these weapons must be kept reliable, safe, and secure without nuclear testing. Meeting this goal will require highly sophisticated computational modeling and simulation, as well as above-ground experimentation. The Nation will continue to need a nuclear weapons production and dismantlement complex, yet one that is substantially smaller, more efficient, and less costly than exists today.

- ***Environmental Stewardship:*** The President recently stated that "Attaining sustainable development is one of the greatest challenges facing our country and the global community -- a challenge that can only be met by developing and deploying technologies that will protect the environment while sustaining economic growth."[9] Such technologies will be required for enhanced clean-up of existing environmental problems, such as the nuclear waste legacy of the weapons production complex, as well as for designing new industrial processes, manufacturing techniques, and modes of economic activity that are resource efficient and environmentally benign.

- ***Maintaining Leadership in Science and Technology:*** The Nation has reaped enormous benefits from its investments in science and technology over the past 50 years, yet continued scientific advance -- the fuel for technology's engine -- will be essential to help solve problems such as protecting the environment, improving human health, ensuring national security, and providing continued economic prosperity. Continued exploration of scientific frontiers contributes to the nation's knowledge base and capacity for innovative solutions to emerging problems and National needs.

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[9] Technology for a Sustainable Future: A Framework for Action, The White House, July 1994, p 1.

- ***Technology Partnerships:*** Among the nation's greatest challenges for the future will be to strengthen and expand public-private partnerships aimed at technology development and enhanced U.S. industrial competitiveness. This challenge requires broad engagement among industry, federal and state governments, and academia in the development of shared visions and coordinated management strategies for accelerating innovation and technology development.

The economic, environmental, national security, and scientific challenges of the 21st Century will require collective national responses which take advantage of disparate yet complementary strengths throughout society. The Department of Energy Laboratories represent one of the major national assets available to help address emerging National needs. The Laboratories are well suited to address such challenges, precisely because of the diversity and depth of their technical capabilities. The Laboratory system has served as a versatile and valuable resource to the nation in the past, with a record of accomplishments that have expanded our understanding of the world, created new fields of science and technology, established new commercial markets, and, in the case of national security contributions, determined the course of history.

In the future, after completing their most substantive change in operating method in decades, the DOE Laboratories will be important players -- teamed with industry, academia, and other government agencies -- in the Nation's concerted effort to provide a sustainable society which provides security, intellectual renewal, and prosperity for future generations. In looking forward during a time of change, the Department of Energy and its Laboratories endorse and embrace the guidance of the President:

> ***"The challenges we face -- from our competitors abroad and from our people at home -- demand dramatic innovation and bold action that will not just revive our economy now but also ensure our economic growth well into the future. Building America's economic strength through technology demands new initiatives that confront these challenges effectively, efficiently, and creatively."***
>
> ***President William J. Clinton***
> **Technology for America's Growth,**
> **A New Direction to Build Economic Strength**

II. DOE Lab Contributions to the Nation's Scientific Enterprise

A. Introduction

On August 3, 1994, the Clinton Administration announced a new National science policy aimed at maintaining world leadership in basic science, mathematics and engineering. Titled Science in the National Interest, the policy document ranks among the most significant Presidential statements on the importance of fundamental science in the past fifty years. The Nation's investment in research and development is heralded for having produced "a scientific enterprise without peer," and our scientific strength is characterized as "a treasure which we must sustain and build on for the future."

The treasure which comprises our scientific establishment involves public and private institutions, researchers, facilities and instrumentation located throughout the Nation. The myriad laboratories and individuals -- and the American public which has provided them with federal public support -- all have reason to celebrate the historic accomplishments which our scientific enterprise has provided, at an accelerating pace, particularly since the end of World War II. We all must also confront the challenges of the future as we seek to sustain U.S. scientific excellence and work to strengthen the role of science in serving core National needs in areas such as improved health care, environmental protection, economic competitiveness, and national security.

In developing a new National science investment strategy, Science in the National Interest states that "we must reexamine every element of the enterprise" to ensure that each element is as strong as it can be given limited resources. The fundamental science portfolio of the Department of Energy (DOE), and particularly of its laboratories, represents one of the nation's major scientific assets, and appropriately should be reexamined as the Nation addresses the challenges and opportunities of a post-Cold War world.

This paper reviews the role of science and technology at the Department of Energy's laboratories and discusses the Department's contributions of the DOE laboratory system to the Nation's research infrastructure. The National goals delineated in Science in the National Interest are used as the structure for describing the contributions of the DOE laboratory system[10] in the past, and for providing recommendations aimed at achieving continued scientific excellence in the future.

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[10] The Department of Energy laboratory system includes nine multi-program, National laboratories;11 smaller, single-program laboratories; and 10 highly-focussed mission-specific laboratories.

B. Science and Technology at the Department of Energy

1. A Tradition of Scientific Exploration

The Department of Energy Laboratories have a rich science and technology base and a tradition of pursuing knowledge at the frontiers of science. As a result, many major scientific accomplishments have emerged from research conducted at the DOE Laboratories. These range from conducting pioneering work on the fundamental structure of matter to expanding our understanding of the global environment to developing technologies to map the human genome.

The construction and operation of large-scale, basic research user facilities has been one of the distinguishing characteristics of the Department of Energy. The origins of this mode of research date back to the invention of the cyclotron in 1929 by Ernest O. Lawrence in Berkeley, California. In 1931, Lawrence established what then was called the Radiation Laboratory to tackle large-scale science in an intentional and intensely multi-disciplinary fashion. To help achieve this purpose, Lawrence built a large cyclotron which was of a scale and character unlike anything that could be built or sustained within an academic setting. His laboratory was the genesis of the present Lawrence Berkeley Laboratory. The cyclotron project set the stage for the development and operation of a series of major research and user facilities which have been signature contributions by the Department's laboratories to the Nation for the past 60 years. Lawrence's work also established the multi-disciplinary approach to problem solving which has been a hallmark of the research environment at the DOE Laboratories ever since.

Among the major research facilities at the Laboratories are major particle accelerators which have effectively defined the fields of high energy and nuclear physics over the past 50 years. Through the construction and operation of a series of powerful particle accelerators, the Laboratories have discovered many of nature's most fundamental particles and revealed the forces which govern their interactions. Recent evidence of the "top quark," the sixth of nature's basic building blocks, through research at DOE's Fermi National Accelerator Laboratory exemplifies such work -- which has helped create the foundation of knowledge that underpins other fields of science.

In the 1950s, the Laboratories developed the means of utilizing a by-product of accelerator operations -- synchrotron radiation -- for exploring new frontiers in materials, chemical, and life science research. The Department's synchrotron radiation facilities (commonly referred to as "light sources") generate powerful beams of ultraviolet light and x-rays for studying materials at the molecular level. These light sources have become indispensable tools for research in areas as diverse as studying materials for integrated circuits, mapping the structure of industrial chemicals, and designing molecules for future use in pharmaceuticals.

The Laboratories also have built and operated facilities which generate powerful sources of neutrons. Because neutrons are uncharged, they can penetrate deeply into sample materials and give precise information on the positions and motions of individual atoms. The neutron research facilities of the Laboratories have provided major advances in our understanding of materials such as superconducting materials, polymers, and liquid crystals used in portable computer displays. These facilities also are a source of radioisotopes for medical, research, and industrial applications. In fact, the field of nuclear medicine and the medical use of radioisotopes trace their origins to work at the DOE Laboratories.

The Department currently operates more than 60 major research and user facilities that provide access to scientific frontiers that would not otherwise be reached for materials, medical, chemical, biological, and pharmacological research. More than 9700 scientists and engineers utilized these major facilities in 1993, representing more than a 50 percent increase over the past six years (Figure 2). Researchers using these facilities represented 278 U.S. colleges and universities, 265 U.S. companies, and 47 U.S. laboratories (Figure 3). The thousands of researchers who conduct their work at these facilities often do so in collaborative teams that combine the complementary strengths and perspectives from industry, academia and the federal government . The resultant contributions of these research performers are measured in the scores of scientific papers, proceedings, patents, and commercial products that emanate from their supporting institutions.

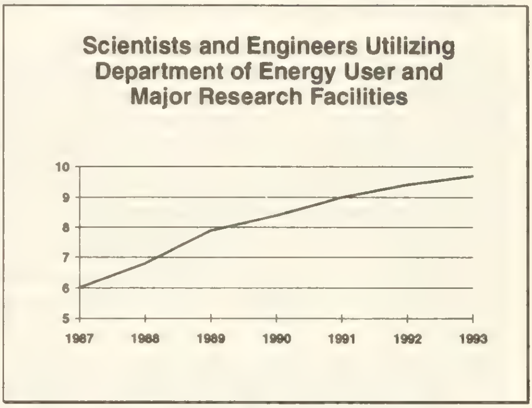

Figure 2. Utilization of Major Research Facilities

The major research and user facilities of the Department's Laboratories exist in synergy with an in-house research staff that complements, but is not necessarily dependent upon, such facilities. For example, small teams of principle investigators at the Laboratories have provided major contributions in areas such as atmospheric chemistry, microbiology, catalysis, and even cosmology. If there is one ubiquitous tool within the Laboratory system, however, it is high performance computers. From the earliest days of computers to the present, the Laboratories have been among the world's leading experts in computational science, modeling, and simulation. Initially driven by the data management requirements of national security, fusion energy, and high energy physics applications, these systems now are fully engaged by the Laboratories in National challenges including global climate modeling, designing fuel-efficient automobiles, and human genome research.

2. Science is Central to the Department's Missions

The examples listed above provide but a few illustrations of scientific and technological accomplishments of the Department and its Laboratories. However, these examples, in-and-of- themselves, do little to convey the cardinal importance of science and technology to the overall success of the Department in meeting its assigned missions. It is no understatement to say that science and technology are the most important means through which a majority of the Department's activities are conducted. This reality is made clear in the Department's May 1994 strategic plan, Fueling a Competitive Economy, which positions science and technology at the center of the Department's five major business lines -- intersecting and amplifying each mission (Figure 4).

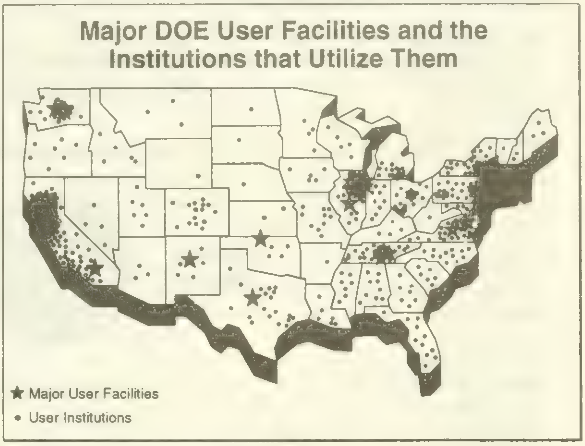
Major DOE User Facilities and the Institutions that Utilize Them
★ Major User Facilities
● User Institutions

Figure 3. Institutions Using Research Facilities

3. Program Scope and Execution

The Department's total science and technology investment for Fiscal Year 1994 was $7.3 billion,[11] amounting to approximately 40 percent of the Department's overall Fiscal Year 1994 budget of $19 billion, and 10 percent of the total federal R&D budget of $74 billion.[12] The Department's $3.4 billion funding of basic and applied research (excluding technology development, equipment, and construction) is fourth among the 16 agencies that are the primary Federal supporters of science and technology. This level follows the National Institutes of Health at $8.9 billion, the Department of Defense at $4.3 billion, and the National Aeronautics and Space Administration at $4.1 billion. The Department of Energy supports the largest federal program in materials research and funds 90 percent of the nation's research in high energy physics.

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[11] Includes research, development, capital equipment and construction of research facilities.

[12] This figure includes R&D and R&D plant operations; source: Science & Engineering Indicators-1993, National Science Foundation, National Science Board.

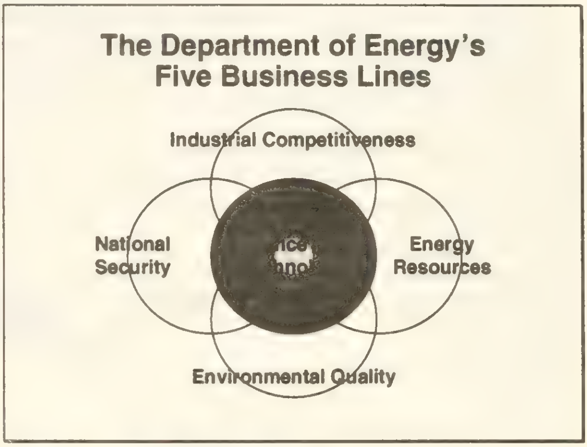

Figure 4. DOE Business Lines

The Department executes its science and technology function in many ways, including through grants to university researchers, cost-shared research programs with industry, construction and operation of major scientific user facilities, and laboratory-based research programs. For example, the Department's research program supports approximately 1800 university R&D grants totaling more than $600 million annually at more than 100 U.S. universities.

The organization and management of the Department's research programs is the primary responsibility of the Department's program managers, who develop and manage research programs in response to legislative and Executive Branch direction. These programs are executed through research performed across a range of R&D performers, sometimes including multiple universities, companies, and DOE laboratories. Through peer evaluation and program reviews, the Departmental program managers ensure that the individual tasks among distributed researchers are integrated and are contributing toward the overall research objectives of the program.

C. DOE Contributions to National Science Policy Goals

The basic and applied research programs of the Department and its laboratories fit well and fully within the goals that are stated in the August 1994 National science policy document, Science in the National Interest. This section describes current activities and past accomplishments for each of the goals delineated in the White House science policy.[13] Recommendations are also included that have been developed by the Department as a means of helping achieve these National goals.

1. Goal: Maintain Leadership Across the Frontiers of Scientific Knowledge

Through its laboratory programs, including through its major research and user facilities, the Department is engaged in scientific exploration that spans from the fundamental building blocks of matter to the far reaches of the Universe to practical applications of physical and biological science.

Research conducted at Department of Energy laboratories has excelled within its disciplines, and also has helped create entirely new fields of scientific inquiry. For example, the Human Genome Program was conceived and initiated by the Department of Energy -- growing out of its long-standing research aimed at measuring radiation-induced mutations in cells and combining that research base with the National Laboratories' exceptional computational abilities. Similarly, the Laboratories have played a major role in establishing and shaping the research agenda in high energy and nuclear physics, plasma physics, nuclear medicine, nuclear engineering, supercomputing, and global climate modeling.

Scientific excellence and leadership has earned an impressive array of scientific awards to the Department. More than 58 Nobel prize winners since 1936 have been supported by the Department of Energy at some time in their careers. Eighteen Nobel prizes have been awarded to Department of Energy laboratory employees, and another 13 to researchers who employed National Laboratory facilities in their award-winning discoveries. Most of the 40 winners of the prestigious Enrico Fermi Presidential awards have done research supported by the Department. Many additional award and distinctions have been presented to Laboratory employees for their contributions in science and technology, including from the National Academy of Sciences, Smithsonian, American Physical Society, and many other scientific organizations.

User Facilities: Creating New Windows on the World

Dow Chemical is involved in a research partnership with one of its commercial competitors, DuPont, along with Northwestern University, at the Advanced Photon Source at the Argonne National Laboratory. The three partners have joined to form a Collaborative Access Team that will conduct research on materials such as catalysts, fibers, engineered polymers, plastic and metal finishes, and electronic materials. As explained by Dow's Vice President and Director for R&D, "The Advanced Photon Source will let us look at materials in ways never before possible. It will be like seeing in color what you've only seen before in black and white."

New facilities under construction by the Department promise continued scientific discovery and world leadership. For example, new ultra-violet and X-ray radiation sources at the Lawrence Berkeley Laboratory and at the Argonne National Laboratory will enable studies of the structure of metals, alloys, ceramics, polymers, and biological molecules, such as proteins and viruses. These studies hold the potential for revolutionary advances in understanding of materials and could result in major future commercial applications in products ranging from fabrics and plastics to designer drugs and computer chips.

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[13] *Science in the National Interest* delineates five major goals for continued stewardship of the nation's basic science enterprise; for the purposes of this White Paper, the fourth and fifth goals--which both address training and education--are combined.

Although the Department's laboratories have a long record of scientific excellence, the challenge is to achieve continuous improvement during a period of scarce resources. The following strategies will help the Department contribute to the National goal of maintaining leadership across the frontiers of scientific knowledge:

- Concentrate and sustain clear areas of world-class scientific excellence.
- Maintain a proper balance between fundamental research, applied research, and technology development and demonstrations.
- Strengthen and expand utilization of peer review throughout laboratory programs to ensure the best scientific and technical performance.
- Sustain and bolster international coordination, especially when large scientific facilities are required.

2. Goal: Enhance Connections Between Fundamental Research and National Goals

The Department of Energy has major National mission responsibilities in the areas of energy resources, national security, fundamental science, and environmental quality. The Department has invested heavily in science and technology to uphold these responsibilities. Science at the National Laboratories in support of these areas is wide-ranging, encompassing both long- and short-term basic and applied research. However, in order to meet the Department's challenging goals for the future, the connections between fundamental research and mission objectives will need to be tighter than ever before.

- ***Energy Resources***: The Laboratories have played a major role in examining the fundamental behavior of materials involved in the generation and use of energy, and in studying energy production and conversion phenomena essential for future energy security. For example, Laboratory research involving crystalline silicon and thin film photovoltaic substrates have contributed to major advances in solar energy. Work by the Laboratories on basic combustion dynamics has translated into more efficient automotive engine designs. Research by the Laboratories on biochemical and thermochemical processes may ultimately pave the way for widespread future utilization of biofuels. Similarly, basic advances in plasma physics and materials science has been essential to major recent accomplishments in fusion research, which could become a major energy source in the future.

Selected Accomplishments of the National Laboratories that have contributed to U.S. Science and Technology Leadership

High-Energy Physics

1950's	Study of cosmic rays gives way to studies of particles and their interactions leading to the construction of the world's largest accelerators, the Bevatron and the Cosmotron.
1970's	The development of the Standard Model provides the first unified theory of matter and sets the stage for all new experimental devices. US is acknowledged leader in the world, in both experiment and theory.
1990's	Discovery of the top quark at the Tevatron is imminent which will cap a 16 year international quest to complete the experimental verification of the Standard Model.

Atomic and Nuclear Physics

1950's	Fundamental research in atomic and nuclear phenomena led to nuclear magnetic resonance and the underlying physics of the laser.
1970's	Practical high-power and semiconductor lasers developed.
1990's	Applications of lasers in communications, medicine, consumer electronics; magnetic resonance imaging for medical diagnostics.

Biomedical Science

1950's	Research on the effects of radiation on cells and genetics,
1970's	Developed the computer axial tomography (CAT scan) and positron emission tomography (PET scan) medical diagnostic techniques.
1990's	Human genome sequencing and mapping; major advances made in structural biology.

Materials Science

1950's	Provided the understanding of carbon composite structures which led to the extensive use of graphite-based materials. Research in radiation damage led to new materials resulting from ion implantation techniques.
1970's	Developed electron beam and laser annealing processes leading to major semiconductor manufacturing technologies. Developed fracture-resistant steels and produced the first metallic glasses.
1990's	Achieved world records in performance of: photovoltaic energy conversion; organic superconductors; superconducting wires, tapes, and devices; batteries and fuel cells. Developed flexible, polymer-based electrolytes; lead-free solder; high-temperature, high-strength intermetallic alloys; and superior welding methods. Discovered world's first magnetic polymer.

Fusion Energy

1950's	The Atomic Energy Commission is one of the world's leaders in initiating the theoretical and experimental foundation of magnetic confinement fusion.
1970's	The Energy Research and Development Agency begins construction of the world-class Tokamak Fusion Test Reactor. The U.S. fusion program is acknowledged to be the world's leader in the field.
1990's	The Department of Energy's Tokamak Fusion Test Reactor achieves world record in controlled fusion energy production. The magnetic fusion program moves toward internationalization of its effort and transfer of its technology to U.S. industry. Inertial fusion provides the technical base for nuclear stockpile stewardship.

- ***National Security***: The nuclear weapons, arms control verification, and nuclear non-proliferation activities of the Laboratories have depended upon, and helped facilitate, a comprehensive understanding across a range of scientific disciplines, including physics, chemistry, mathematics, materials science, and computational science. With the cessation of underground nuclear testing, basic science will play an even greater role than it has in the past in providing the basis for safe and secure stewardship of the nuclear stockpile. To meet their national security missions in the future, the Laboratories will need to develop a stronger scientific base within the weapons program through enhanced computation and simulation activities, and through more advanced work in areas such as inertial confinement fusion, materials science, neutron radiography, and pulsed power. Science, and not nuclear testing, will be the foundation for maintaining confidence in the safety and reliability of our nuclear deterrent.

- ***Environmental Quality***: The Laboratories have performed a wide range of research in areas that contribute to our understanding of environmental contamination, environmental systems, and pollution prevention and mitigation. For example, the Laboratories are at the forefront of research on air pollution and its movement through the atmosphere. This work, with origins related to the study of atmospheric nuclear testing, focuses on areas including atmospheric chemistry, acid rain, stratospheric ozone depletion, and global climate change. The Laboratories have played a major role in developing increasingly sophisticated climate models and are developing the elements of a comprehensive Earth-systems model that integrates the impact of human and natural activities on the Earth's environment. Environmental research also is being performed at the Laboratories in ecosystem functioning and responses to change, bioremediation, hydrology, and health risks from low-level exposure to energy-related chemicals. These areas of research have led to the development of environmental technologies and integrated ecosystem management, and will be essential for helping meet the estimated $300 billion nuclear clean-up challenge which is a legacy of the nuclear weapons production program.

The following strategies will help the Department contribute to the National goal of enhancing the connections between fundamental research and national needs.

- Increase joint planning of research programs and technology development programs.
- Invest in research that supports the development of environmental, national security, and energy technologies.
- Examine opportunities for enhanced leveraging of the R&D base for meeting mission needs.

3. Goal: Stimulate partnerships that promote fundamental science and engineering and effective use of physical, human, and financial resources

Partnership mechanisms for working with the DOE Laboratories include consulting agreements for university professors, long-term guest assignments for industrial and foreign researchers, user programs for major facilities, cost-shared contracts, and Cooperative Research and Development Agreements (CRADAs). The first two mechanisms are particularly effective in promoting broad-based fundamental research.

Partnerships with university and industrial scientists and engineers are a central operating approach at the DOE Laboratories. This is evidenced, for example, by the more than 20,000 scientists and engineers who were guests at the multi-program laboratories in 1993; approximately one-third were from industry.[14] At the Oak Ridge National Laboratory alone last year, guest scientists and engineers numbered almost 4400, more than double the number five years earlier. Of these, 1700 were industry participants, an increase of 22 percent over the number in 1991. These guests represented the equivalent of about 1500 additional full-time laboratory scientists, effectively doubling the productive scientific workforce at Oak Ridge. Experience at the other National Laboratories is similar. These partnerships are helping the productivity and vigor of the laboratories while benefiting industry and contributing to the Nation's science and technology enterprise.

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[14] Guests are researchers who visit and work at a laboratory for a period of ten days or more. A much larger number of people (over 200,000) visit the laboratories for shorter periods of time to do research or to talk with laboratory staff, or to tour the site.

Assignments of faculty, students, and industrial scientists to laboratories generally are paid for by the supporting organizations.[15] In addition, companies invest significant funds at the laboratories in support of experimental use at user facilities, such as the Department's advanced light sources. At the National Synchrotron Light Source at the Brookhaven National Laboratory, many industrial users have spent $2 - $3 million apiece to provide the beam line equipment for their experiments. Since this equipment is of use only to the facility, it is left behind for other users when the industrial partner has completed its work. Costs for beam lines at the new Advanced Light Source and the Advanced Photon Source are substantially greater because of the greater complexity and capability of the facilities. Access to the beam lines at these new facilities has already been claimed by dozens of teams of government, academic, and industrial users. The total investment so far by industry in equipment at DOE light sources is in excess of $100 million.

The Department currently has more than 1000 CRADAs with over 700 industrial partners. While the majority of these partnerships are related to specific product or development efforts, almost 20 percent involve basic research. An even larger fraction involve work that has grown out of previously sponsored basic research. The Department and the Laboratories continue to seek CRADA arrangements with companies interested in advancing basic science.

Improved partnership arrangements could further promote the effectiveness of the Laboratories, and increasingly are essential in meeting National needs. The following strategies will help the Department contribute to the National goal of stimulating additional, effective partnerships that promote science and engineering:

- Further expand utilization of laboratory user facilities through simplified access by industry and universities.

- Increase opportunities for remote, "on-line" access to Laboratory research facilities. This service will eventually greatly expand access to user facilities by scientists, engineers, and even classrooms, through access via public communication networks such as Internet.

- Further streamline CRADA and other technology partnership procedures to shorten the time and reduce the complexity of finalizing agreements.

- Continue to seek CRADA arrangements with companies interested in advancing basic science.

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[15] Sometimes the costs are covered by a separate university or industry research contract with the government, but not by the laboratory.

4. Goal: Produce the Finest Scientists and Engineers for the Twenty-first Century and Raise the Scientific and Technological literacy of all Americans

DOE has capabilities that distinguish it from other agencies and institutions and allow it to make significant contributions to this National goal. The laboratories' large scientific work force, geographic diversity, world-class scientific facilities, technology development expertise, and capabilities in forming partnerships allow the Department to provide technical training and public enrichment experiences throughout the country. These facilities are major sites for undergraduate and graduate research performed as part of the normal educational curricula for thousands of students.

College and university-based education programs have been supported since the early days of the Atomic Energy Commission through student fellowships and research opportunities, curriculum development, and faculty enhancement. Undergraduate programs are conducted at both two-year and four-year institutions. Graduate and post-doctoral programs enhance research opportunities through fellowships at home institutions and Department of Energy facilities. Representative undergraduate and graduate programs include:

- The Science and Engineering Research Semester, which provides the opportunity for science and engineering students to participate in research during an academic term at seven of the Department's National Laboratories.

- The Faculty/Student Team Research program, which supports participation of faculty members with a small group of undergraduate and graduate students in on-going research at Department of Energy facilities.

The Department also makes significant contributions to all levels of mathematics and science education to help enhance the literacy of the public in science, mathematics and engineering. The Department's funding for pre-college education programs (K-12) has increased by approximately 400 percent over the past five years, reflecting the growing understanding that these early learning years are extremely important in motivating and retaining students' interest in mathematics and science.

The Department's pre-college programs improve the skills and knowledge of new and existing teachers, provide alternative learning environments, encourage curriculum reform, disseminate new materials and media, provide equipment and technical assistance to teachers, foster research on new methods and materials, and provide opportunities for students and teachers to perform research on current science and technology. Specific examples of DOE programs developed with or by the National Laboratories are:

- The National Science Bowl, an annual competition involving roughly 12,000 high school students nationwide.

- The Bay Area Science and Technology Education Collaboration, a multi-laboratory teacher enhancement program to improve math and science education in the Oakland Unified School District for grades K-12.

- The Teachers' Academy for Mathematics and Science in Chicago has set a goal of retraining over 15,000 math and science teachers in grades K-12 in this largely minority, largely poor urban system. This initiative emerged from collaborations by the Fermi National Accelerator Laboratory and Argonne National Laboratory with universities, museums, teachers' colleges, corporations and citizens' groups.

- Becoming Enthusiastic About Math and Science (BEAMS) brings fifth and sixth grade classes, with their teachers, to the Continuous Electron Beam Accelerator Facility (CEBAF) in Newport News, Virginia for a modified academic week.

- The New Explorers series of PBS television programs on topical science and technology issues, uses teaching materials developed under the leadership of Argonne National Laboratory.

The following strategies will help the Department contribute to the National goal of producing the finest scientists and engineers for the twenty-first century and raising the scientific and technical literacy of all Americans:

- Maintain excellence in recruiting scientists and engineers to the laboratories for continued intellectual renewal of these institutions and training of top graduates at the frontiers of science and technology.

- Strengthen laboratory interactions with universities.

- Continue to focus on pre-college enrichment educational programs for underrepresented populations.

- Continue to integrate education programs into the activities of the laboratories.

D. Conclusion

"Science reveals new world's to explore, and by implication new opportunities to seize and new futures to create." This statement by Vice President Al Gore[16], quoted in Science in the National Interest, captures the importance of a strong National investment in science and technology. For the Department of Energy and its laboratories, science and technology are the currency for meeting our mission requirements. The Laboratories support world-class scientists and engineers and unique, advanced research facilities which, help address complex, multi-disciplinary problems in areas ranging from national security to fusion energy to environmental clean-up.

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[16] The statement was made by Vice President Gore to the Forum on Science in the National Interest in February, 1994.

The research facilities at the Laboratories provide access for thousands of academic and industrial scientists to new frontiers in areas such as materials science and molecular biology. In this fashion, and by virtue of their distinguished record of scientific accomplishments, the Laboratories represent a National asset that warrants careful stewardship during an era when science holds the potential for addressing major National needs in health care, environmental quality, national security, and sustainable development. The Administration's new science policy provides the framework for helping sustain and guide the Department's scientific facilities and programs in the face of tight competition for resources. These facilities, like basic science in general, have provided a means of discovery and a record of technological innovation. The dividends of this investment will continue to accrue for generations to come.

III. Peer Review at the Department of Energy

A. Introduction

Merit review with peer evaluation is a powerful and effective tool for enhancing relevance and productivity in Federal research and development (R&D). Despite some of its well-documented shortcomings,[17] peer review stimulates competition, establishes high standards for quality, rewards productivity, and, on balance, fosters creativity and promotes fair play. When combined with energetic and visionary R&D program leadership, peer review can marshal highly competent R&D teams, focus scarce resources on the most important and potentially fruitful technical opportunities, and provide reasonable assurances to taxpayers that their Federal R&D dollars are being prudently invested.

On May 6, 1994, in a White House memorandum, the Office of Science and Technology Policy (OSTP) and the Office of Management and Budget (OMB) established merit review with peer evaluation as an "R&D policy principle" to be incorporated in all Federal agency R&D budgets for Fiscal Year 1996. Specifically, according to the memorandum, each Federal R&D agency is expected to

> ***"significantly enhance the utilization of merit review with peer evaluation and competitive selection in Federal R&D projects. Research not subject to merit review with peer evaluation is expected to decline and funding in these areas should be moved into areas of merit-reviewed research with peer evaluation."***

Further, increasing concern about accountability for efficient and productive use of government funds, including funds for government-supported R&D, has been reflected in recent Federal legislation and executive direction. The Chief Financial Officers Act, the Government Performance and Results Act, the Competition in Contracting Act, the revision of the Federal Acquisition Regulation, the National Performance Review initiative, and a number of other program evaluation initiatives from OMB have all had a profound effect on Federal agency management, oversight, and conduct of R&D programs.

The Department of Energy (DOE) fully embraces these principles of accountability, competition, and objective merit review, including peer review. In fact, it has already put in place many new ways of doing business that are strengthening their application. This paper documents the Department's continuing and expanding commitment to these principles and, in particular, to peer review.

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[17] Chubin, Daryl E. and Hackett, Edward J., *Peerless Science: Peer Review and U.S. Science Policy.* (Albany, NY: State University of New York Press, 1990).

B. Scope of Peer Review at the Department of Energy

At the Department of Energy, peer review means competent, qualified, objective, and formal evaluation using (1) specified criteria and (2) the review and advice of qualified peers. To be qualified, peers must be technically competent in the scientific and technical field under review. Peers may come from any source, including industry, academia, and government agencies and associated laboratories. To be objective, peers must be reasonably independent and free from conflict of interest. The results of peer reviews must be recorded and, under appropriate controls, accountable to further review.

Merit reviews meeting these criteria take on many and diverse forms. They are applied to R&D proposals, projects, and programs. They are applied, as well, to the design and acquisition of major research facilities and to the formulation of multiyear research plans and strategies. Appropriate forms of peer review are constructed and applied to activities at various organizational levels: the Department Secretary, Assistant Secretaries, program offices, National Laboratories, integrated laboratory R&D, research subcontractors (including universities), and laboratory user facilities. The nature of peer review at each level is tailored to the needs at that level.

Peer reviews are usually undertaken in the context of the allocation and use of scarce R&D resources. They may be used in conjunction with competitive selection processes, where peer reviews take place prior to the award or approval of a grant or contract, or where the research activities are chosen from a pool of qualified applicants following peer reviews. These types of peer review are called pre-award, or *prospective*, reviews. Peer reviews may also be used in conjunction with evaluations of ongoing or recently completed research. These in-progress or performance reviews are called post-award, or *retrospective*, reviews. These latter reviews also strongly influence the allocation of R&D resources by what is sometimes referred to as selection by competitive survival.

Although the terms *prospective* and *retrospective* are useful constructs to describe *when* merit reviews with peer evaluation take place, the substance of both types of reviews are quite similar. In both cases, the merit of an investigator's or research group's record of accomplishments (retrospective considerations) *and* the projected course of future research (prospective considerations) bear directly on the evaluation.

1. Statutory and Regulatory Context

The Department of Energy, like other Federal R&D agencies, must carry out its scientific and technical missions within a larger context of statutory, regulatory, and procedural requirements governing the expenditure of R&D funds. This context varies for different programs, but in each case largely determines the way in which peer review principles and methods are applied.

The award of research contracts, for example, is governed by the Federal Acquisition Regulation and the Competition in Contracting Act, both of which require competition among bidders and formal selection processes. The Department employs peer review principles and methods, including the use of independent engineering and scientific reviewers, in the technical evaluation stage of all such selection processes related to R&D, except in relatively rare instances where sole-source selection may be justified.

Further, the award of research grants and cooperative agreements is governed by the Department's Financial Assistance Rules, as promulgated in the Code of Federal Regulations (10 CFR Part 600). The Department's major research organizations have promulgated formal rules in the CFR governing the merit review process for R&D financial assistance. These rules require the use of technical experts to perform credible merit reviews of all applications, solicited and unsolicited. Such merit reviews may make use of standing committees, ad hoc committees, or field readers, and generally include, in the spirit of peer evaluation, at least three qualified persons from outside the awarding program office, in addition to the designated contracting officer's representative.

A combination of Federal and Departmental regulations also governs the award of contracts at the Department's laboratories. Under the Federal Acquisition Regulation, a management and operating (M&O) contract is recognized as an appropriate instrument, or agreement, under which the government

> ***"contracts for the operation, maintenance, or support, on its behalf, of a government-owned or controlled research, development, special production, or testing establishment wholly or principally devoted to one or more major programs of the contracting Federal agency."***

Such M&O contracts permit the Department to draw upon, nurture, and maintain the special technical expertise and capabilities required for unique missions, such as those associated with nuclear weapons and large, multidisciplinary, integrated, non-weapons research. Over the years, the Department's missions and associated requirements for such specialized expertise and capabilities have given rise to the Department's laboratory system. Altogether, the replacement cost of the facilities of this system is currently estimated to exceed $30 billion. The laboratories employ about 50,000 people, representing a concentration of technical talent that includes more than 8,500 Ph.D.s and several Nobel laureates.

Examples of specialized research facilities located at these laboratories include accelerators for the study of high energy physics, the world's most powerful computers and lasers, synchrotron light sources for probing the structure of materials, facilities for producing medical isotopes, and instrumentation laboratories for characterizing the details of flame propagation and combustion. The Department owns and maintains these facilities and, with the exception of the classified facilities, makes them available to researchers from all sectors of the economy, public and private. The Department underwrites the operating costs for experimenters who openly share their data with the scientific community. Commercial users may also use the facilities to conduct proprietary research, but on the condition that they participate on a full-cost-recovery basis. Peer review is routinely employed to allocate available time and select the experiments conducted at the major research facilities, with some facilities having waiting lists exceeding a year.

Under a DOE-initiated contract reform[18], the Department's M&O contracts now require, or will soon require, regular performance-based merit reviews to ensure accountability in M&O contractor performance. M&O contracts that do not now contain such requirements will incorporate them when the contracts come up for renewal or renegotiation. In addition, all laboratories have an array of outside advisory panels that periodically review and advise on the relevance and productivity of laboratory-conducted R&D.

Finally, one M&O contractor seldom performs all of its R&D tasking by itself. Whether under a lead-laboratory or other management arrangement with the Department, a portion of the R&D is typically subcontracted to universities, private laboratories, or other R&D performers. At the National Renewable Energy Laboratory, for example, one-half of the laboratory's total funding supports research subcontracted to outside R&D performers. At Argonne National Laboratory, Oak Ridge National Laboratory, and Pacific Northwest Laboratory, this figure varies between 10 and 20 percent. At other laboratories, this figure is less. All such subcontracts, likewise, are governed by contract provisions that generally require both competitive selection processes, which in the case of R&D generally involve merit reviews with peer evaluation, and periodic evaluations of contractor performance.

2. R&D Programs Subject to Peer Review

The Department's overall R&D budget for Fiscal Year 1994 is estimated, depending upon one's precise definition of R&D, to be about $7.4 billion, as shown in Appendix A. This amount may be grouped into three broad, roughly equal, categories: fundamental science and energy research ($2.4 billion); civilian energy technology and related R&D ($2.8 billion); and national security R&D ($2.2 billion).

Of the $7.4 billion total, approximately 20 percent supports research carried out by R&D performers employed outside the Department and its laboratory system. Performers include industry, universities, public and private research institutions, and R&D consortia. The instruments used to convey funding to these R&D performers include Department-awarded grants, cooperative agreements and contracts, and laboratory-awarded research subcontracts.

Of the remaining 80 percent, most supports research and related activities carried out by performers within the Department and its laboratory system. Of this, approximately 40 percent supports the operation, maintenance, construction, and modernization of the specialized research and related user facilities. Another 35 percent supports internal laboratory research programs. The remaining 25 percent supports other functions, including general infrastructure (for example, roads, utilities), overhead, and other indirect costs.

The mix of R&D activities calls for a variety of approaches to managing research and applying peer review principles and methods. For example, research by outside R&D performers, because of the nature of the procurement instruments used to convey funding, is governed by statutory and regulatory requirements that require, in one form or another, merit reviews, mostly with peer evaluation, in conjunction with pre-award competitive selection processes. The M&O contracts are, likewise, competed and regularly evaluated, with increasing emphasis on specific performance-based measurement criteria. Also, because experimental time on the special facilities is so highly valued and demand exceeds supply, virtually all access to the facilities is allocated through some means of merit review with peer evaluation.

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[18] U.S. Department of Energy, "Making Contracting Work Better and Cost Less; Report of the Contract Reform Team." (Washington, DC: U.S. Department of Energy, February 1994).

Peer review coverage of the internal research programs at each laboratory is, likewise, varied. The greater portion is subject to retrospective merit reviews, called for by management and conducted most often by scientists who are independent of the laboratory, in conjunction with outside program reviews and advisory committee oversight. A lesser portion is subject to prospective peer review as exemplified somewhat narrowly by the highly successful laboratory directors' discretionary R&D program and more broadly by the many programs managed within Departmental headquarters that apply peer review principles and methods to the evaluation of laboratory Field Work Proposals. This latter process is illuminated later in this paper.

Even though the Department applies different peer review methods to guide its research programs, both outside and internal, a sampling of R&D projects, using retrospective merit review by independent experts, provides evidence that research quality and relevance of both types of research programs are comparable. For example, an organization within the Office of Energy Research (the Office of Program Analysis) regularly conducts, at the invitation of R&D program managers, retrospective peer reviews of R&D programs throughout the Department. Using an interactive method with independent, outside expert reviewers, this organization has evaluated more than 2,700 research projects over 12 years, covering about 20 percent of the Department's civilian basic research and technology development programs. The most recent data, which includes 744 research projects in Basic Energy Sciences conducted at both national laboratories and universities, produced results showing that the research programs of both internal and outside R&D performers shared nearly identical statistical profiles on research quality and relevance. These retrospective peer reviews, it should be noted, are in addition to other reviews administered by the program managers and serve as an independent measure of research quality and relevance.

Finally, above the project level, at higher levels of decisionmaking in the organizational hierarchy, the Department makes extensive, although not comprehensive, use of expert advisory bodies, constituted under the Federal Advisory Committee Act, and the National Academies. Peer input is also obtained from workshops, technical society meetings and symposia, and extensive publication in the peer-reviewed literature.

C. Current Peer Review Practices at the Department of Energy

The scientific and technology development missions of the Department of Energy are extraordinarily diverse and far-ranging. The Department is among the largest supporters of fundamental science and basic research across many disciplinary areas and technical fields. Its applied research and technology development programs concentrate primarily on the

Department's energy, environmental, and national security missions, but in doing so embrace countless forefront areas of research vital to industry, commerce, and trade. The Department also builds and equips many of the premier R&D facilities vital to U.S. competitiveness and used by U.S. universities, corporations, and nonprofit research institutes.

In these respects, the Department is endowed with highly valuable R&D resources for which there is intense competition. The Department has found over the years that this competition is most productively and equitably managed by merit review practices that involve objective reviews and advice, that is, by peer review. It has also found, however, that peer review practices must be appropriately tailored to each context, depending on the nature of the research activities performed and the R&D community served.

Finally, and importantly, peer review systems at the Department do not now, nor must they in the future, preclude the possibility of initiating some research programs without peer review. Preserving this flexibility is vital. Programs representing entirely new research directions, research at the interfaces between established communities, or essential elements in critical mission areas often do not survive traditional peer review. If the Department had applied peer review rigidly, without flexibility or regard to such weaknesses, it might not have funded Dr. Luis Alvarez, whose work ultimately led to the meteor-impact theory of the extinction of the dinosaurs. This was world-class science -- neutron activation analysis of iridium anomalies in soil samples at the Cretaceous-Tertiary geologic boundary -- that used the Department's skills and facilities in novel ways that led to a revolution in thinking about our planet and its history.

1. Fundamental Science and Energy Research

Virtually all of the Department's fundamental science and energy research programs undergo merit review of one form or another in order to ensure scientific excellence and mission relevance. Peer evaluation is used extensively in these merit review processes.

Nearly all research conducted by R&D performers outside the Department and its laboratory system is governed by formal processes of prospective merit review with peer evaluation and competitive selection. Such processes are codified under the Office of Energy Research's Financial Assistance Program (10 CFR Part 605), which, with some exceptions for flexibility, requires each funded grant proposal to receive a minimum of three external peer reviews. Proposals are peer reviewed for scientific excellence. This process shares many features of the merit review system of the National Science Foundation. Performance is also reviewed as part of all renewal proposals, which typically occur on three-year cycles.

Internal research programs at the Department's laboratories, likewise, undergo merit review. These reviews consist of a mix of prospective and retrospective reviews, and in many cases, both. They employ varying degrees of peer evaluation at both the laboratory and Departmental oversight levels, including regular annual reviews of program management and onsite project reviews by Departmental staff. In addition, all labs, user facilities, and major research divisions have visiting committees of outside experts that provide annual peer review of research relevance and quality.

Every internal laboratory research program is also reviewed annually by Headquarters as part of the laboratory Field Work Proposal (FWP) submission process, in accordance with the provisions of the governing M&O contracts. Field Work Proposals are the means by which the laboratories formally propose future work and seek authorization for expending R&D funds. Field Work Proposals may vary in the extent of their specificity, but in those programs that depend heavily on the use of prospective peer review in approving laboratory R&D funding, FWPs are required to be of peer review quality. Such practices are routine in the Office of Health and Environmental Research, the Experimental Plasma Research portions of the Fusion Energy Program, several major divisions of Basic Energy Sciences, and others.

In the Office of Health and Environmental Research, for example, all FWPs are required to be of peer review quality and to be externally reviewed by independent experts. Regardless of merit review method, all research projects are annually reviewed, and any project may be redirected or terminated as a result of these reviews. All new proposals are subject to merit review with peer evaluation.

Because one of the primary goals of all scientific research is to advance the forefront of knowledge, publication of original work is an essential element of the overall research activity. DOE-supported scientists, whether outside R&D performers or internal to the laboratories, are continually evaluated by the quality of their original research as published in archival, peer-reviewed journals. This publication of original work in the open literature in itself constitutes another and important form of peer review. The Department relies upon it to both guide and gauge the relevance and productivity of its internal research activities.

The Department also makes extensive use of the National Academy of Sciences and a number of standing committees constituted under the Federal Advisory Committee Act. The Office of Energy Research, for example, routinely obtains advice on program content, quality, future direction, priorities, and proposed facilities from the Basic Energy Sciences Advisory Committee, the Health and Environmental Research Advisory Committee, the High Energy Physics Advisory Panel, the Nuclear Sciences Advisory Committee, and the Fusion Energy Advisory Committee. Their expert and independent nature enable these advisory committees to provide additional and valuable outside advice used to guide the Department's R&D activities at the overall program level.

2. Civilian Energy Technology and Related R&D

The objectives of the civilian energy technology and related R&D programs, such as those focused on energy efficiency, pollution prevention, environmental management, renewable energy, coal, oil, and natural gas, largely aim at advancing technologies for use in the general economy. This means that the management and direction of such programs must involve not just technical experts, but also those who will ultimately manufacture, market, and use the technologies. This calls for collaborative modes of R&D review and conduct that fully engage participation among those who understand competitive markets and consumer demands.

Accordingly, many of the Department's energy technology development and related R&D programs are deliberately designed to accommodate industrial partners. In various ways, these industrial partners provide substantial opportunities for external merit review by engaging themselves as full participants helping to plan, execute, and commercialize the R&D.

In addition, the Department makes extensive use of R&D procurement arrangements that not only involve industry, but require cost-sharing by industry. Section 3002 of the Energy Policy Act of 1992 establishes minimum cost-sharing thresholds of 50 percent for technology demonstration and commercialization projects, and 20 percent for all other civilian energy research. The resulting contracts thus benefit both from the routine competitive selection practices, as prescribed in Section 935.016-1 of the Department of Energy Acquisition Regulation, and from one of the most severe outside tests of research relevance, that is, substantial financial investment from industrial R&D partners.

At the Department's national laboratories, there is likewise a significant degree of external review of, and internal competition for, the energy technology development and related R&D programs. Every laboratory has an array of industrial advisory panels employed to review the R&D activities of each of its major research divisions. Individual research investigators must continually submit to a battery of scientific and technical reviews, both prospective and retrospective. Prospective evaluations include merit reviews of individual work proposals, almost always involving internal peers and sometimes involving external peers. Prospective evaluations also include multilevel internal reviews of the laboratories' formally submitted Field Work Proposals before they are sent to Departmental headquarters. Retrospective evaluations are performed on all R&D projects at least annually, but more typically are performed as an integral part of the course of ongoing research -- by colleagues, laboratory superiors, clients at Headquarters, as well as by peer reviewers of research publications. In addition, retrospective evaluations using peer review are employed on an ad hoc or sampling basis to review ongoing research involving specific projects, cooperative research and development agreements (CRADAs), and other forms of joint R&D.

Input from peers is also obtained from contractor review meetings, workshops, technical society meetings, and symposia. Fossil Energy programs and Energy Efficiency programs have made use on a selective basis of the Office of Energy Research's Office of Program Analysis to conduct formal, independent, retrospective peer reviews of their applied research projects.

Peer review processes in some elements of the Department's civilian R&D programs are currently undergoing significant enhancement. The Technology Development program of the Office of Environmental Management, for example, is instituting peer review at the program level (see below), and is strengthening the use of "focus area review groups" at the sub-program level. Beginning in Fiscal Year 1995, laboratory Field Work Proposals, known in the Environmental Management program as Technical Task Plans, will be reviewed by teams of subject matter specialists from technical, regulatory, business, and stakeholder perspectives.

Virtually all major energy technology development and related R&D programs are periodically subjected to higher level overall program reviews involving extensive use of scientific and technical experts and industry stakeholders. The most visible of these are review committees of the National Academy of Sciences and the standing Departmental advisory committees constituted under the auspices of the Federal Advisory Committee Act. These bodies are asked primarily to comment on the content and direction of the R&D programs, including their 5-year R&D plans and associated strategic plans.

In the Technology Development program of the Office of Environmental Management, for example, top-level program reviews are conducted by the Environmental Management Advisory Board and, beginning in Fiscal Year 1995, a newly established Committee on Environmental Management Technologies of the National Academy of Sciences. Similarly, the Office of Fossil Energy is advised by the National Petroleum Council and the National Coal Council. Altogether, there are eight active committees advising the civilian energy technology and related R&D programs.

Finally, with the implementation of strategic planning and Total Quality Management principles throughout the Department, most key planning and programming decisions are now evolved in full view of and with broad participation from outside stakeholders. For example, the Department's recently developed multiyear plan for Integrated Resource Planning was distributed to 350 stakeholders in the electric and natural gas utility industry, with formal comments received from 40 reviewers. In the Department today, every such plan must evidence extensive use of outside independent participation, review, and comment.

3. National Security R&D

The Department's national security responsibilities require highly integrated, multidisciplinary, multiyear team efforts. These requirements are imposed by both the complexity and seriousness of the nuclear weapons enterprise. The Department must maintain its responsible stewardship of the nuclear weapons stockpile and preserve the special nuclear weapons technology infrastructure and core competencies that may be needed in future national security situations. At the same time, it must dismantle nuclear weapons and dispose of special nuclear materials, as specified by international agreement, and contribute to the enforcement of arms control agreements and to the prevention of the proliferation of nuclear weapons. The R&D needed to support these missions requires unique facilities, special materials-handling procedures, and highly classified know-how that, while amenable to technical review and peer review, are not always amenable to the same kind of peer review processes that are employed in the realm of unclassified research.

The Department has established, for example, formal peer review processes in the Office of Defense Programs. Weapons life-cycle activities are addressed by formalized joint Department of Energy-Department of Defense project teams whose members come from both organizations. The Nuclear Weapons Council provides a high-level mechanism for advising on Defense Programs directions. Interaction with the Department of Defense also provides close customer feedback on major aspects of program performance.

The Department also uses formal committees composed of outside experts to review or advise on Defense Programs, including the Safety, Security, and Control Committee; the Weapon Safety Advisory Review Group; and the Inertial Confinement Fusion Advisory Panel. The Containment Evaluation Panel and the Threshold Test Ban Review Panel have also reviewed issues related to nuclear testing.

Defense Programs also uses independent outside expert groups, such as JASON (a highly qualified advisory body of scientists), to review its classified programs. The National Academy of Sciences has also reviewed Defense Programs technical activities. A large amount of unclassified research conducted within the Defense Programs is published in open peer-reviewed journals. There is also a classified peer-reviewed journal to which laboratory researchers actively contribute.

In the case of nuclear device design and much of the related weapons science and technology, detailed review requires active expertise, and there exists no broad industrial or university base from which to draw such experts. Historically, technical competition has proven invaluable in this field and peer reviews are so designed into program activities in large part by the existence of two nuclear design laboratories, at Lawrence Livermore and Los Alamos. One-on-one interactions between researchers in highly classified but related fields at these two laboratories add considerably to the quality improvement process at both laboratories.

Sandia National Laboratory employs an effective means of intramural review, using "red teams" to ensure the safety and reliability of Sandia components and processes. Defense Programs has further established a formal interlaboratory (Los Alamos, Lawrence Livermore, and Sandia) peer review process for specific weapon R&D, certification, and surveillance activities. For example, every five years, with annual updates, Lawrence Livermore-Sandia and Los Alamos-Sandia teams in the Weapons Assessment Process conduct peer-reviewed studies of each other's stockpile weapons.

Recent M&O contracts for Los Alamos and Lawrence Livermore require the University of California to conduct annual science and technology self-assessments stressing external peer reviews with specific criteria. These are being implemented using evaluations by appropriately constituted external review committees of experts. These committees, taken together, evaluate all technical activities at these laboratories. The University of California President's Council Panel on National Security reviews the weapons programs of Los Alamos and Livermore. Panel members include technical experts drawn from outside the University of California and laboratory communities. These and other mechanisms are used to assess and maintain quality in these programs.

D. Comparisons with Other Federal Agencies

More than 20 Federal agencies carry out R&D programs. Of these, the Department of Energy's R&D program is one of the largest, being responsible for about 10 percent of the total Federal R&D budget of $72 billion in Fiscal Year 1994. In addition, the Department of

Energy has perhaps one of the most diverse set of missions, complicated by the unique demands of nuclear weapons design.

Because of this diversity and size, the Department's R&D programs taken together resemble the many facets of Federal R&D programs as a whole. Similarly, the Department's application of peer review principles and methods share many of the strengths, as well as some of the weaknesses, of such practices as applied to Federal R&D in general. Other agencies, for example, use an array of peer review methods, at all organizational levels, to promote quality, relevance, and productivity in R&D programs. The Department, likewise, applies these methods to the different levels in the management process hierarchy, and to the different types of R&D activities, as is most appropriate to each situation.

The National Institutes of Health, the National Science Foundation, and many parts of the Department of Energy's fundamental science, health and environmental research, and basic energy sciences programs all have extensive external research programs in the physical and life sciences. Each agency uses similar prospective peer review methods, by mail, or by panels, before funding proposals. Some agencies with their own laboratories also make available their research facilities for the benefit of other users, such as the National Aeronautics and Space Administration's wind tunnels. Research at such user facilities, like that at the Department's facilities, is merit-reviewed using prospective peer reviews.

Like the Department of Energy, the Departments of Defense and Commerce (the National Institute of Standards and Technology), the National Aeronautics and Space Administration, and, to some extent, the National Institutes of Health (NIH) all conduct internal laboratory research programs. Each agency relies primarily upon in-progress, retrospective reviews for guiding and gauging its internal laboratory research.

In the area of basic research, the National Institutes of Health is an agency often cited as a model for emulation in its use of merit reviews with peer evaluation. Ninety percent of the research activities at NIH are external, and are subjected to a two-stage review process. In the first stage at NIH, a panel of 15 to 20 scientists, experts in the relevant field, read each proposal. Generally, three panel members review each proposal in detail against specified criteria and prepare formal briefs, while the other panelists familiarize themselves with each proposal. All panelists take part in a group discussion and vote formally. The panel then reports to a National Advisory Council for the second stage. Each institute of the NIH has a single National Advisory Council of at least 12 members, not all of whom are necessarily scientists (in most proposals, there are considerations beyond pure science).

Review of internal laboratory research at the NIH is conducted by the Board of Scientific Counselors for each institute. Each board consists of outside scientists chosen for their expertise related to each institute. However, it should be noted that many Board members are funded by the institute under review.

An authoritative critique[19] of the NIH peer review system concluded that (a) the excellence of the overall NIH research program is built on a variety of approaches to managing research, using both prospective and retrospective reviews; (b) prospective and retrospective peer review have different strengths and weaknesses, and encourage creativity in different ways; and (c) the overall NIH research program was best served by retaining prospective review in its external (for example, R&D support via grants) programs and retrospective review in its internal (for example, in-house laboratory) programs.

As strong as the NIH and other agency peer review practices appear to be, in each area where commonality exists among research kind (for example, basic research) and communities (for example, universities, research centers), the Department of Energy has well-established peer review practices that are quite comparable and, perhaps, better in some areas. This comparability notwithstanding, the Department can only benefit by examining more thoroughly and understanding more completely the best practices of other agencies. To this end, the Department intends to continue its study of other agency practices, participate in interagency forums on peer review, and implement some pilot programs to test innovative approaches.

The sharing of peer review strengths, however, means that the Department may also share some of its weaknesses. The process of merit review with peer evaluation, in general, is under pressure and has been criticized by many in the research community, in part, due to its cost, complexity, administrative burden, lack of available peers, slowness, and questions about equity and fairness. Even with these concerns, however, peer review is still widely regarded as the best method available for allocating scarce R&D resources. Accordingly, the Department of Energy seeks ways to both respond to these concerns and develop improved peer review systems, as outlined below.

E. Conclusions and Opportunities for Improvement

As documented in this paper, the Department of Energy uses peer review extensively throughout its R&D programs to both guide research direction (prospective peer review) and gauge research progress (retrospective peer review). In many instances, both forms of peer review are applied to the same research activity. The Department's peer review practices in many of its more mature R&D programs may be counted among the best practices of all agencies. Peer review practices in some of the more recently established and growing R&D programs are evolving and being strengthened. Virtually all major R&D programs experience multiple levels of review by qualified and independent review and advisory committees.

External R&D activities conducted via grants, contracts, and cooperative agreements are governed by an elaborate system of statutory, regulatory, and procedural requirements that virtually ensure that the vast majority of R&D awards are subjected to merit reviews with peer evaluation and competitive selection. Internal laboratory R&D activities are likewise subjected to multiple reviews by peers, both prospective and retrospective, with increasing competition. Retrospective merit reviews with peer evaluation have been confirmed by independent studies as an effective means for promoting research relevance and productivity in the laboratories. Moreover, in many Departmental laboratory R&D programs, retrospective reviews are increasingly being supplemented by prospective reviews of laboratory Field Work Proposals, where appropriate. Administrative requirements for cost-sharing and joint planning of applied R&D with industry add further to the checks and balances of R&D management.

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[19] National Institutes of Health, "Report of the External Advisory Committee of the Director's Advisory Committee." (Washington, DC: National Institutes of Health, April 1994).

In April 1994, the Department reaffirmed its strong commitment to peer review in its strategic plan, *Fueling A Competitive Economy*, by specifying that an important "success indicator" for its science and technology programs is

> ***"quality of science, as indicated by favorable outside peer reviews and judgment of expert advisory committees."***

Recognizing the importance of peer review, having surveyed peer review practices at other Federal agencies, and having reviewed the suggestions of such experts as Chubin and Hackett,[20] Bozeman,[21] and Kostoff[22] for the evaluation and improved use of peer review, the Department intends to strengthen further its use of peer review, in forms appropriate to its missions, in all of its technical programs, and at all levels of decisionmaking.

In so proceeding, the Department recognizes that serious reviews can impose major costs on those being reviewed, as well as on the reviewers and supporting staff. Peer review systems can introduce significant delays in R&D program execution. If implemented too rigidly, peer review systems can stifle flexibility and creativity. The experiences of several R&D agencies suggest that it is possible to create elaborate systems of overlapping reviews that are unnecessarily complex and burdensome.

Being aware of these potential risks, the Department has identified three broad areas for improvement.

F. Enhanced Application of Peer Review

First, *while recognizing the need for flexibility and efficiency, the Department of Energy will seek to enhance the use and application of peer review at all appropriate levels of R&D program management and execution.*

- Peer review applied at the highest level of management checks the research agenda and helps to inform the processes that establish top-level guidance for R&D priorities throughout the agency. Filling a gap in such coverage, an advisory task force for strategic energy R&D, similar to those advising the Secretary on science and defense matters, will be chartered to serve this function under the auspices of the Secretary of Energy Advisory Board.

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[20] Chubin, Daryl E., et al., *op. cit.*

[21] Bozeman, B., "Peer Review and Evaluation of R&D Impacts", in ed. Bozeman, B., and Melkers, J., *Evaluating R&D Impacts: Methods and Practice*, p. 79-98. (Boston, MA: Kluwer Academic Publishers, 1993).

[22] Kostoff, R., "Assessing Research Impact: Federal Peer Review Practices", in ed. Kostoff, R., *Evaluation Review* vol. 18, No. 1, p. 31-40. (Sage Publications, February 1994).

- Where appropriate, gaps will also be filled in the coverage of expert advisory committees at the Assistant Secretary level and in the use of outside expert peer reviews at the major R&D program level.

- Recognizing that outstanding leadership can often take R&D programs to great heights of accomplishment, the Department will include R&D program leadership, at both Departmental headquarters and in the field, as a specific element in future major R&D program reviews.

- In its laboratory system of Field Work Proposals, the Department will encourage enhanced quality of FWPs and the expanded use, where appropriate, of prospective merit reviews with peer evaluation of FWPs for new projects, emulating current practices of many of the Department's basic research programs.

- At the outset of new major R&D program initiatives, plans will be established, as appropriate, to apply peer review principles and methods at all suitable levels.

- In implementing the Department's initiatives in contract reform, measurements of contractor performance, including M&O contractors, will be extended, as appropriate, to include an evaluation of the use of peer review principles and methods.

1. Improved Peer Review Processes

Second, *the Department of Energy's management of its peer review processes will be strengthened, including the establishment of guiding policies and principles, improved oversight, and broadened documentation of use.*

- The Department will build on the successful peer review record of many of its programs, and establish guidelines for conducting peer review at various levels of management, tailoring them to meet the particular information needs and unique features of the programs and missions to which they would apply.

- Periodic and random sampling will assess the use and effectiveness of the peer reviews and identify areas for improvement. This may also include broadened coverage of the in-progress peer review program currently under way in the Office of Energy Research.

- A process for linking peer review principles and methods and other evaluative activities to the Department's strategic planning, budget formulation, and performance management activities will be developed and implemented, in conjunction with related efforts responding to the Chief Financial Officer Act and the Government Performance and Results Act.

- The Department will explore ways to reward the effective use of peer review, including simplification of administrative procedures and relaxation of oversight controls, in areas where R&D excellence has been demonstrated.

2. Peer Review Research and Innovation

Third, *the Department will be a leader in examining peer review processes and best practices, and in developing and implementing recommendations for improvements in the application of peer review to today's science and technology environment.*

- As part of the Department's oversight of peer review practices and increased use of performance-based contracting, collection of data on the practice and nature of various forms of peer review will be established. Information on current peer review practices will address, to the extent practicable, methods, costs, and benefits, and identify areas of improvement.

- Research on improved methods for peer review will be encouraged and communicated. Tradeoffs must be addressed between accountability and scientific freedom, efficiency and thoroughness, as must issues of the effectiveness, robustness, responsiveness, fairness of review, and adherence to technical standards of good measurement, including validity and reliability.

- A study, including surveys of the literature and interviews with both private and Federal agency R&D managers, will examine the various models for conducting Federal R&D and propose innovative approaches to the application and use of peer review to the accomplishment of the Department's R&D missions.

- A series of pilot programs will be established to test the expanded use of peer review, or modifications of peer review, in areas where it is not now uniformly applied, or where prospective reviews might be beneficially substituted for some retrospective reviews, such as in some of the Department's internal laboratory R&D programs.

- While some parts of the Department have excellent peer review systems already in place, new criteria for selection and effective use of peers will be developed and added to Departmental guidelines, as needed. These criteria may address such issues as the competence and objectivity of peers and methods to deal with reviewer bias and dysfunctional group dynamics.

Appendix A

SCIENCE & TECHNOLOGY FY 92-94			
		FY 1993	FY 1994
	FY 1992	Adjusted	Adjusted
	Actual	Approp	Approp
Area	$M	$M	$M
FUNDAMENTAL SCIENCE & ENERGY RESEARCH			
Energy Research			
Biological & Environmental Research	369.5	380.6	412.3
Basic Energy Sciences			
Materials Sciences	253.4	273.3	271.6
Chemical Sciences	156.5	163.6	166.3
Energy Biosciences	24.4	25.5	26.6
Engineering & Geosciences	35.4	36.5	37.2
Applied Math Sciences	80.5	83.9	103.7
Advanced Energy Projects	54.7	11.0	11.2
All Other BES	155.5	258.1	173.8
Subtotal BES	760.4	851.9	790.4
Other Energy Research			
Advanced Neutron Source	0.0	0.0	17.0
University & Science Education Programs	54.1	55.9	57.9
Laboratory Technology Transfer	10.0	9.9	39.2
Multi-Program Laboratory Support	25.6	26.7	41.3
All Other	15.8	15.7	20.1
Subtotal Other ER	105.5	108.2	175.5
TOTAL ER	1,235.4	1,340.7	1,378.2
GENERAL SCIENCE			
High Energy Physics	618.4	606.1	617.5
Nuclear Physics	351.4	306.6	348.6
SSC Not Including Terminiation Costs	482.6	515.4	0.0
All Other	6.4	(21.7)	9.0
TOTAL GEN SCI	1,458.8	1,406.4	975.1
TOTAL FND SCIENCE	2,694.2	2,747.1	2,353.3
CIVILIAN ENERGY TECH DEVELOPMENT & RELATED R&D			
CLEAN COAL TECHNOLOGY			
Advance Appropriation - Round 4 & 5	460.1	525.0	400.0

Appropriation	(50.0)	(525.0)	(175.0)
TOTAL CCT	410.1	0.0	225.0
FOSSIL ENERGY R&D			
Coal	225.6	186.3	167.3
Petroleum	56.5	61.6	75.3
Natural Gas	63.2	79.5	96.1
All Other	95.2	86.7	92.0
TOTAL FE R&D	440.5	414.1	430.7
CONSERVATION R&D			
Transportation	109.3	138.6	178.6
Utility	4.7	4.9	6.8
Industry	96.7	111.7	125.0
Buildings	47.1	52.3	81.4
Policy & Management	2.7	3.6	4.7
TOTAL CONS R&D	260.5	311.1	396.5
RENEWABLES R&D			
Solar energy	174.3	186.2	252.3
Geothermal	26.9	23.2	24.0
Hydrogen Research	0.0	0.0	10.0
Hydropower	1.0	1.1	1.1
Electric Energy Systems	30.4	32.1	38.6
Energy Storage Systems	7.2	10.2	17.5
Policy & Management - CE	1.9	2.9	3.9
TOTAL RENEW R&D	241.7	255.7	347.4
NUCLEAR ENERGY			
Civilian Nuclear Power			
Light Water Reactor	61.9	57.8	57.6
Advanced Reactor R&D	60.0	59.2	41.8
Facilities	96.6	92.7	6.7
Subtotal Civ Nuc Pwr	218.5	209.7	106.1
Space-Related Programs			
Advanced Radioisotope Power	51.9	54.4	52.7
Space Reactor Power System	40.0	29.8	27.4
Space Exploration Initiative	5.0	0.0	0.0
Subtotal Space-Related	96.9	84.2	80.1
Others			
Oak Ridge Landlord	0.0	0.0	24.9

Test Reactor Area Hot Cells	0.0	0.0	1.4
Test Reactor Area Landlord	0.0	0.0	0.0
Adv Test Reactor Fusion Irridation	0.0	0.0	0.0
All Other Except Termination Costs	48.9	48.0	23.1
Subtotal Others	48.9	48.0	49.4
TOTAL NE R&D	364.3	341.9	235.6
ENERGY RESEARCH			
Fusion Program	332.2	335.2	343.6
URANIUM ENRICHMENT			
AVLIS	161.7	0.0	0.0
Alternative Applications	1.0	0.0	0.0
TOTAL UE	162.7	0.0	0.0
RADIOACTIVE WASTE R&D			
Nuclear Waste Fund Activities	275.1	275.1	260.0
Civilian Waste R&D	5.1	4.9	0.7
Defense Nuclear Waste Disposal	0.0	100.0	120.0
TOTAL RW	280.2	380.0	380.7
ENVIRONMENTAL RESTORATION & WASTE MGMT			
Technology Development Defense	286.3	333.7	397.5
Technology Development - Civilian	0.0	0.0	0.0
TOTAL ER & WM	286.3	333.7	397.5
ES & H - ENVIRONMENTAL R&D			
Epidemiology & Health Surveillance	47.7	49.5	49.2
TOTAL TECH DEVEL & REL R&D	2,826.2	2,421.2	2,806.2
NATIONAL SECURITY R&D			
Atomic Energy Defense Activities			
Weapons Activities - R&D	1,431.7	1,536.0	1,298.8
Naval Reactors Development	695.2	730.0	684.4
Nonproliferation & Verification R&D 1/	210.0	219.9	235.0

Educations Programs	49.9	52.6	0.0
TOTAL NATL SEC R&D	2,386.8	2,538.5	2,218.2
TOTAL DOE	7,907.2	7,706.8	7,377.7

1/ Estimated amount for FY 1992; actual amount not available.

IV. Core Technical Capabilities of the DOE Laboratories

A. Introduction

The Department of Energy Laboratories are the product of several decades of investment by the nation both in facilities and in a highly trained workforce of scientists, engineers, technicians, and other support personnel. This paper provides quantitative and qualitative information about the core technical capabilities of the laboratories, and about how these capabilities are represented in terms of the laboratories' budgets, personnel levels, replacement value of major facilities, industrial partnerships, patents and licenses, and R&D 100 awards.[23] Short narrative profiles for each of the nine multi-program laboratories and the National Renewable Energy Laboratory are provided to give a fuller picture of the distinguishing characteristics of these institutions.

B. Core Technical Capabilities

Over the past several years, the Department of Energy laboratories increasingly have been using the concepts of "core competencies" and "core technical capabilities" as a means of assessing and managing their key areas of technical strength. The core competency concept has been utilized effectively in the private sector as companies have worked to achieve enhanced focus and market expansion based on their firms' distinctive strengths.[24] In 1993, the Department initiated a process aimed at adapting the core competency methodology to the entire DOE laboratory system. That effort resulted in the first-ever characterization of the core competencies of the DOE laboratories.[25]

DOE defines a core competency *as a distinguishing integration of capabilities that enables an organization to deliver mission results and products to its customers.* The major criteria which the Department has used to determine its core technical capabilities are:

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[23] The R&D 100 Awards are given each year to innovations both in public and private institutions which hold a high prospect for commercial success. The Department of Energy laboratories have received more of these awards than all other federal agency laboratories combined; more than 50 percent of the113 award-winning DOE technologies between 1989 and 1992 already have been commercialized.

[24] C.K. Prahalad and Gary Hamel, The Core Competence of the Corporation, Harvard Business Review. May-June, 1990, pp. 79-91.

[25] The results of this excercise were reported in Changes and Challenges at the Department of Energy Laboratories: Report of the Laboratory Missions Priority Team. That report termed the major laboratory strengths as "core competencies." Others have commented that these more accurately are the "core technical capabilities" of the laboratories. For this purposes of this paper, the term core technical capabilities is used.

- ***Vital to Mission Delivery***: The core technical capabilities exist to enable the organization to achieve its current and future missions and/or strategic intent;

- ***Distinguishing***: The organization is recognized as being one of a few to achieve excellence in its areas of expertise;

- ***Comparative Advantage***: The capability enables the laboratory to add value to the solution of a broad set of national problems in a fashion that is distinctive from other R&D performers;

- ***Difficult to Reproduce***: The expertise and capabilities embodied by the invested resources are difficult for others to duplicate; and

- ***Demonstrated***: The capabilities have had prior or current effect when applied to problems of national importance; and

- ***Enduring Value***: Competencies have been built to enable the organization to satisfy past, present and future mission, and they need to be responsive to mission changes of the future;

These criteria helped lead to establishment of the following eight core technical capabilities for the DOE Laboratory System:

- ***Advanced Materials Synthesis, Characterization and Processing***. The laboratories employ more than 2,000 scientists and engineers in advanced materials R&D and operate state-of-the-art facilities for conducting materials synthesis, characterization, and processing. Synthesized materials include high-performance ceramics, metallic alloys, intermetallics, polymers, composites, aerogels, superconductors, semiconductors, and high performance magnetic materials. Materials characterization is conducted at diverse facilities throughout the DOE complex including synchrotron light sources, neutron scattering centers, microscope facilities, high-temperature materials laboratories, and centers for microelectronics technology development, design and fabrication. The labs also have unique resources for processing materials, such as actinides and actinide alloys, as well as forming and heat-treating exotic alloys, shaping ceramic composites, developing optical materials, formulating and applying aerogels, and depositing multicomponent thin films. *Working with industry, universities and other Federal agencies, the laboratories provide a vital resource -- including scientific user facilities -- for advances in materials technologies critical to future national needs in energy, environment, health, industrial competitiveness, and security*.

- ***Advanced Computing, Modeling and Simulation***. The high-performance computing core competency has been a major basis of weapons design for more than 40 years. This capability includes integration of theory, modeling, simulation and advanced computing, and networking for a wide variety of engineering and experimental designs. All DOE laboratories use networking and high-performance computing to address complex problems by integrating theory, modeling, and simulation. Major DOE laboratories also all have important classes of supercomputing capabilities including vector and parallel processing computer power. *Scientific computing is crucial to missions such as designing nuclear weapons, predicting global climate change, and conducting fundamental research. It also provides essential underpinnings for such emerging missions as enhanced oil recovery and artificial intelligence.*

- ***Advanced Manufacturing and Process Technology***. The DOE labs have extensive experience in assembling multidisciplinary research teams to address various technological challenges particularly in support of national security and energy needs. Teams have drawn on competencies in engineered materials and processes; engineering sciences; electronics and microelectronics; high-performance computing; rapid prototyping and testing; reliability physics and engineering; process characterization; and modeling and systems integration. Strengths in microelectronics, photonics, reliability engineering, materials and process development, and modeling have resulted in multimillion dollars of cooperative research and development agreements with segments of the U.S. semiconductor industry. *These production processes provide a technical and management foundation for the laboratories to make a significant impact on U.S. competitiveness through industry-driven initiatives*.

- ***Biosciences and Biotechnology***. These integrated and multidisciplinary capabilities enable development, use, and understanding of living organisms for genomics, structural biology, bioinstrumentation, health risk assessment, bioremediation, bioprocessing of fossil fuels, conversion of biomass to fuels and chemicals, biological solar energy conversion, and bioprocess engineering. The DOE laboratory complex contains an array of unique facilities that support biotechnology R&D, including synchrotron light sources, neutron sources, biomedical imaging systems, bioprocessing research facilities, transgenic mouse facilities, chromosome processing resources, clone libraries, and databases. The competency is built on expertise in biological, health and environmental sciences, chemical and physical sciences, engineering, instrumentation and high-performance computing. *This set of capabilities can promote human health, enhance environmental quality, develop more secure and safer energy sources, and improve the competitiveness of U.S. biotechnology firms*.

- ***Advanced Energy Technologies and End-Use Applications***. The laboratories possess expertise in a wide range of energy supply and end-use technologies including policy and risk analysis and energy, environmental, and economic modeling. In particular, the DOE labs constitute the world's leading resource in advanced nuclear energy technologies, including advanced fission reactors, space nuclear power, atomic-vapor laser isotope separation, and both inertial and magnetic fusion. The laboratories have provided the technical basis for commercial use of solar thermal, solar photovoltaic, wind, biomass and other forms of renewable energy sources and are developing energy storage technologies, supercapacitors and chemical fuel cells for automotive use, and cleaner fossil-fuel energy cycles. Also, lab-based superconductivity pilot centers work with industry to promote commercialization of high-temperature superconductors. *For the most part, these efforts could not exist outside the environment of multidisciplinary institutions such as the DOE Laboratories*.

- ***Environmental Science and Remediation Technology***. This emerging core competency is defined as characterizing, evaluating, and monitoring the environment as a complex system. It includes remediating past and present environmental insults and ensuring future environmental sustainability. Capabilities supporting environmental technology include earth sciences and engineering (atmospheric, oceanic, land surface and subsurface); chemistry and chemical engineering; physics; biology; materials; advanced computation and simulation; molecular sciences; robotics; societal phenomena; and information management. The labs take a broad-based approach to this work, ranging from fundamental science programs to technology development. *Maintenance of these capabilities will contribute to the national welfare by reducing the cost of environmental restoration and waste management at DOE sites, as well as at other federal agencies and industry. It also will significantly expand new scientific knowledge and contribute to a cleaner environment*.

- ***Nuclear Science and Technology***. This category includes a broad spectrum of disciplines, technical capabilities, and facilities essential to DOE's national security and civilian research missions. Unique strengths include nuclear and thermonuclear physics and the physical models and experimental capability necessary to model and verify complex phenomena. Applications include inertial fusion for civilian and military applications and magnetic fusion for energy production. Underlying capabilities include plasma physics, radiation transport, interactions with matter at extreme states, three dimensional hydrodynamics, and instrumentation and diagnostics for extremely fast, high-energy events. High-energy and nuclear physics programs encompass the fields of elementary particle physics (which strives to understand the basic structure of matter and fundamental forces) and nuclear physics (which studies how these particles and forces combine to form nuclei). This competency also encompasses physics, chemistry and technology of light, medium, heavy and transactinium radioactive materials, nuclear safety, security, intelligence and power applications. These capabilities are essential to the future DOE security mission in nonproliferation, dismantlement, safety, security, and stewardship of nuclear materials.

- ***Integrated Defense Science and Technology Competencies***. These enabling technologies and competencies, required for nuclear weapons development and testing, remain critical to maintaining nuclear deterrence and to guarding against nuclear weapons proliferation. Numerous spinoffs serve the commercial world. For example, seismology theory and instrumentation -- highly refined for nuclear weapons testing -- remain important for detecting treaty violations. And advances in the science are important for predicting volcanic action, understanding earthquakes, and for oil and mineral exploration. Other examples include electronics, navigation, computer science, aerodynamics, control of nuclear weapons and materials, atmospheric and other environmental sciences, accelerators, advanced manufacturing, and system engineering and rapid prototyping. The infrastructure provided by this competency allows an unequaled capability for solving complex problems of national importance in defense and industry.

C. Guide to Core Technical Capability Data Charts

The following pages provide data on the core technical capabilities of the Department's nine multi-program laboratories and the National Renewable Energy Laboratory. The information is provided in seven different measurement categories, with four pages of data per category. The measurement categories are listed below. The first three of each four-page set of data catalogues information according to the eight core technical capabilities described above. The fourth page in each four-page set captures data about five additional core technical capabilities for specific laboratories, plus a category labeled "other" which represents laboratory strengths that did not fit within the established core capability definitions.

1. ***Operating Dollars***: Data is for Fiscal Year 1993, based on Budget Authority provided by Congress. Operating budgets do not include construction funds.

2. ***Full-time Equivalent Employees***: Total staff, by core capability category, at end of Fiscal Year 1993.

3. ***Replacement Value of Facilities***: Data covers only those major facilities valued at greater than $25 million. Replacement cost based on rebuilding the facility on a "green field" site, without derivative utilization of other established buildings.

4. ***CRADAs with Industry*:** The total number of Cooperative Research and Development Agreements from 1989 through the end of 1993. Approximately 600 CRADAs existed at the end of 1993. As of October 1994, the number had grown to more than 1000.

5. ***Value of CRADAs with Industry*:** This chart provides cost-shared value of the operational CRADAs in effect at the end of Fiscal Year 1993.

6. ***Patents and Licenses*:** For the year 1993, approximately 500 new U.S. patent applications were filed based on laboratory innovations and 410 licenses were awarded.

7. ***R&D 100 Awards*:** These awards are given annually by R&D Magazine to institutions, both public and private, for innovations which have a significant prospect for commercial success. The data covers the award-winning technologies at the laboratories over the period from 1989 through 1993.

D. The Ten National Laboratories Reviewed by the Galvin Task Force

1. Argonne National Laboratory (ANL), Illinois

ANL is a multi-disciplinary R&D facility capable of conducting both large- and small-scale projects. Its wide ranging scientific and technical expertise often is called on to attack challenges ranging from nuclear non-proliferation to industrial technologies to basic research. The 4,800-member Lab staff aggressively pursues collaborative, technology-transfer partnerships with industry, university, and with other federal labs and agencies. Among ANL's core competencies are:

- ***Large Accelerator based User Facilities***: Design, team-building, construction, and operation of large accelerator-based user facilities, with emphasis on involving the user community in the total process -- such Lab-user partnerships often are guided by boards made up of members of industry, academia, and government.

- ***Nuclear Reactor Technology***: ANL is the only U.S. publicly funded institution with comprehensive skill in design and operation of nuclear reactors and related fuel cycle facilities. This competency is supports the development of reactor and fuel cycle technologies, safety engineering, design of reduced enrichment fuels, and operation and training for reactors overseas.

- ***Environmental Science and Technology***: Programs are devoted to R&D on advanced characterization and remediation technologies, and substantial work supporting site clean up for the DOE complex. ANL partners with Midwest manufacturers to address environmental issues, waste minimization, energy storage, and transportation technologies. ANL also is a full member in the national multilaboratory partnerships with the automotive and textile industries.

- ***Materials Research / Superconductivity***: ANL hosts the largest federally funded materials research program in superconductivity. As one of three DOE pilot centers for the commercialization of superconductivity, ANL conducts extensive research with industry, focusing on components for electric power systems.

Argonne's world class user facilities include the:

- Advanced Photon Source,
- Intense Pulsed Neutron Source,
- Argonne Tandem Linear Accelerator System
- Structural Biology Center, and
- High Performance Computing Research Facility.

2. Brookhaven National Laboratory (BNL), New York

BNL was founded in 1946 by nine Eastern universities which needed a convenient user facility where projects too large for any one of them could be built and operated. The Lab and its 3,500-member staff have been fulfilling that need ever since. BNL conducts basic and applied research on problems ranging from the top quark to superconductivity and from global change to advanced radiation therapy. BNL's major facilities and their competencies are:

Alternating Gradient Synchrotron (AGS): The AGS is a proton and heavy ion synchrotron with a maximum energy of 33 GeV and the highest flux of any accelerator of this energy. Three Nobel prizes, the discovery of CP violation in K decays, the discovery of the muon neutrino, and the discovery of the J/psi particle were awarded for work done at the AGS. A fourth, for the suggestion of parity violation, was made for work carried out at AGS during 1956.

- Relativistic Heavy Ion Collider (RHIC): RHIC is a storage ring in which counter rotating beams of heavy ions, injected from the AGS, will collide and produce the density and temperature of nuclear matter characteristic of the early stages of the universe. It will be ready for experiments in 1999.

- High Flux Beam Reactor (HFBR): The HFBR is a 60 Megawatt reactor designed to maximize the flux of neutrons for neutron scattering experiments, mostly in condensed matter. Neutrons are a unique, nondestructive tool for probing magnetic materials, crystal structure of materials containing light elements, vibrational modes in solids, and the interior of solids. There are more than 270 users of the HFBR in areas such as condensed matter physics, biology, chemistry, applied science, and industrial applications.

- National Synchrotron Light Source (NSLS): NSLS is two electron storage rings which provide X Ray, ultraviolet, and infra red beams for research in materials science, biology, chemistry, medical, and industrial applications. There are over 3400 users, including scientists from universities, industry, and other government laboratories.

Other facilities include the Positron Emission Tomograph (PET) which uses positron decays to produce images of the brain, and STEM, a scanning transmission electron microscope which is unique in its capabilities. These facilities are used not only by outside users but also by BNL researchers.

3. Idaho National Engineering Laboratory (INEL), Idaho

INEL includes more than 890 square miles of remote, accessible terrain, well-suited for development, demonstration and operation of complex processes. The Lab's 7,400-member staff represents the largest concentration of technical professionals in the region. INEL is recognized internationally for integration of engineering, applied science and operations to meet critical needs associated with energy supply, environmental management, national security and advanced technology development and demonstration. INEL's core competencies are:

- Systems Integration and Engineering: INEL discerns the future impacts, requirements, and potential problems associated with each of its major programs. The Lab's demonstrated skill in this are has resulted in more than 45 years of safe, environmentally conscious and cost effective operations. INEL has developed and operated 52 unique nuclear reactors, and contributed extensively to the safe applications of this technology in both the commercial power and national security sectors.

- Complex Process Development, Demonstration, and Operation: INEL efficiently move technical ideas from concept to operational status. A wide variety of prototype development and demonstration projects in support of environmental technology applications, renewable and alternative energy systems, advanced transportation concepts, advanced manufacturing methods, and non-proliferation technology applications have been successfully undertaken. Applying this core competency is evidenced by the successful operation of (a) major test reactors, including the Advanced Test Reactor, (b) chemical processing facilities, such as the Idaho Chemical Processing Plant, (c) manufacturing facilities, such as the Specific Manufacturing Capability Facility, and (d) commercial processes, such as automated welding. Capabilities required to design, construct, integrate, and operate such facilities are unique within the DOE complex, because of the breath of applications and the magnitude and complexity of facilities. INEL infrastructure, project management skills, systems integration, and engineering support provide the necessary ingredients for new and expanded missions in this area.

- Environmental Technology Development and Waste Management: INEL has pioneered in developing and providing methods for characterizing, treating and storing radioactive and hazardous waste, including high- and low-level waste treatment technologies. INEL's leadership in environmental technology and waste management result from a unique integration of capabilities including remote handling, biological and chemical processing, instrumentation and sensors, and earth and environmental sciences. INEL's competencies in systems integration and engineering, and in complex process development, have provided the foundation for meeting all environmental-related "records of decision" and supporting milestones on schedule, while maintaining the lowest cost in the laboratory system.

INEL is marked by an emphasis on applied science and engineering to bridge the gap between basic research and practical application, culture oriented toward providing maximum value to customers, proven ability to leverage environmental capability to regional natural resource industries, and unique infrastructure enabling a full range of design, development, demonstration and operations.

In addition, INEL continues to cost effectively leverage limited programmatic resources through a variety of partnership arrangements to facilitate transfer of technology to the private sector.

4. Lawrence Berkeley Laboratory (LBL), California

LBL's dedication to scientific excellence has garnered a host of awards -- including nine Nobel prizes. Its close connection with the University of California at Berkeley permits the lab and its 2,700-member staff to be especially aggressive in educating future scientists and engineers as well as improving the quality of K-12 science education. LBL core competencies include:

- ***Advanced Materials, Synthesis, Characterization and Processing***: Fundamental research here led to the development of detectors based on high-temperature superconducting materials, advances in nuclear magnetic resonance, nanoscale materials for energy applications, basic knowledge of chemical reactions in combustion, and surface-science research.

- ***Advanced Computing, Modeling and Simulation***: Activities include programs in three gigabit network testbeds; developing systems such as digital video analysis; research on economical paths to high-volume, high-speed data storage; and Internet-based multimedia applications for worldwide network-independent teleconferencing.

- ***Advanced Manufacturing and Process Technology***: LBL leads the Automation Technical Area within AMTEX, a partnership with the integrated U.S. textile industry. Other programs involve advanced lithography, and micro-electromechanical systems which apply processing techniques developed for semiconductors to the design of microscopic sensors, actuators, and motors

- ***Biosciences and Biotechnology***: Activities include the rational design of pharmaceuticals; research on coronary artery disease; the biology of breast cancer; advanced imaging techniques like tritium NMR, high-resolution positron emission tomography, and radiopharmaceutical chemistry; transgenic mouse facility for testing atherosclerosis treatments and for on-going clinical hereditary studies; genomic DNA sequencing supported by development of automated instrumentation; lipoprotein and atherosclerosis research program.; and a hematopoiesis program.

- ***Nuclear Science and Technology / High-Energy and Nuclear Physics***: LBL supports research in the nuclear and chemical properties of the heaviest elements; leadership in the STAR experiment at Brookhaven's Relativistic Heavy Ion Collider; participation at Fermilab includes CDF and D0 detector collaborations; originating the technical basis and now partners in the B-Factory at SLAC; astrophysics programs including a search for distant supernovae, direct detection of dark matter, investigations of the cosmic microwave background and the Sudbury Neutrino

Observatory. This research is supported and complemented by premier programs in designing and building particle detectors and in many areas of accelerator physics and technology, including design and analysis, superconducting materials and magnets, and beam electrodynamics.

- ***Advanced Energy Technologies & End-Use Applications***: Programs include development of inertial-confinement fusion energy; gas and oil recovery and geothermal resources; energy efficiency; and creation of technologies, processes, and analytical methods in building technology, transportation, utilities, industry, and policy development.

- ***Environmental Science & Remediation Technology***: LBL research is aimed at understanding the formation, transport, transformation, mitigation, and ecological effects of pollutants on the environment including research in fractured porous systems such as soil and rock; advanced site-characterization, remediation, and separation methods for use at contaminated sites or sites with special geologic interest; subsurface barrier technology; methods for removing and recovering toxic metals from aqueous waste streams; hazards of the indoor environment including radon and other indoor air pollutants; research on climate change; and fundamental actinide chemistry and processes that impact environmental remediation and restoration.

Among LBL national research facilities are:

- The Advanced Light Source,
- The 88-Inch Cyclotron,
- The National Center for Electron Microscopy, and
- The National Tritium Labeling Facility.

5. Lawrence Livermore National Laboratory (LLNL), California

LLNL and its 7,900-member staff focus their efforts on global security, global ecology, and bioscience. LLNL offers a demonstrated ability to apply science and technology effectively on a large scale, thanks to a broad culture of diverse disciplines and well-developed links to industry and the university R&D communities. Core competencies and characteristics include:

- ***Nuclear Science***: LLNL is one of two nuclear weapon design laboratories and has applied this knowledge to fusion and nuclear energy, atomic (x ray) and nuclear physics, and astrophysics. The Lab serves as an expert resource on international nuclear weapon and nuclear materials issues.

- ***Computation***: LLNL operates several supercomputer centers, including the DOE's national supercomputer center and network, and the national information storage laboratory. The Lab deployed the first machines of many generations of new computers; developed scientific computation, operating, and system control languages; pioneered time sharing and network management; and is engaged in the national effort to develop massively parallel computational capabilities.

- ***Lasers***: The LLNL world-leading laser program is very directed, developing lasers which have specific applications -- adding to the national capability in glass lasers, metal vapor and dye lasers, and now solid state diode lasers. The Lab has adapted these technologies to astronomy, satellite systems, biology, and advanced manufacturing.

- ***Instrumentation and Sensors***: Instrumentation and sensor capabilities derive initially from the critical and demanding needs of weapons testing. The requirements for laser, biology, environment, and energy systems and for precision engineering have further evolved this capability.

- ***Bioscience***: LLNL, one of the three DOE centers for the study of the human genome, has mapped most of chromosome 19 with sequenced, cloned DNA fragments and has helped locate 170 genes, 3 repair genes, and many biological functions and pathologies associated with this chromosome. In addition, Livermore is developing bioscience applications for healthcare, environmental cleanup, and energy conversion.

- ***Materials and Processing***: LLNL developed materials that are the lightest known solids, best thermal and electrical insulators, and with the highest toughness-to-weight ratio; fabricated materials an atomic layer at a time; built microstructures and micromachines; and, in collaboration with Russian scientists, increased the growth rate of optics crystals by 100 times. The Lab developed and uranium laser isotope separation (AVLIS); this is the nation's largest and most complex process technology transfer.

Among unique facilities at LLNL are the National Energy Research Supercomputer Center (NERSC); the world's most powerful laser (Nova); the laser isotope separation demonstration facility (AVLIS); the best instrumented hydrodynamics test facility (FXR); the country's most advanced energetic materials research facility (HEAF); the most precise diamond turning machine (LODTM) which cut metal mirrors for the Keck telescope; the electron beam ion trap (EBIT) capable of studying atomic structure of any element at extremely deep ionization levels; the nation's most productive and diverse center for accelerator mass spectrometry (CAMS); the nation's atmospheric release advisory capability (ARAC) which analyzed Chernobyl in real time; the national center for global climate model comparison; the genome research center; and environmental technology demonstration facilities for dynamic underground stripping, for groundwater cleanup, and for mixed waste treatment.

6. National Renewable Energy Laboratory (NREL), Colorado

NREL has a compelling mission: "[to lead] the nation toward a sustainable energy future by developing renewable energy technologies, improving energy efficiency, advancing related science and engineering, and facilitating commercialization." Further, NREL is the only DOE Laboratory solely dedicated to developing renewable energy technologies (RETs) and related energy efficiency technologies, which includes helping to build a viable industry. NREL's current technical staff of more than 500 represents the largest concentration of expertise focused on renewable energy technologies in the world. This highly trained staff is further augmented by unique experimental and user facilities.

To help meet its challenging mission, NREL carries out its activities using a process called vertically integrated research and development (R&D) and partnership development by working closely and in parallel with industry, university, and national lab partners, as well as other stakeholders, to evolve and develop technology of commercial interest through all its stages -- from basic research through applied research, engineering, product development, manufacturing support and, finally, in a supporting role, commercialization. These efforts rely heavily on four core competencies:

- Advanced Materials and Prototype Component Development
- Development and Characterization of Renewable Energy, Energy Efficiency, and Waste Conversion Processes
- Systems and Process Engineering and Integration for Renewable Energy and Energy Efficiency
- Establishing Partnerships for Market and Technology Development for Renewables and Energy Efficiency

In addition, as part of this vertically integrated process NREL, guided by a number of review and advisory boards made up of members of industry, academia, users, and institutions:

- Serves as the focal point for planning and implementing the federal RET R&D program in industry and universities;
- Technically evaluates and plans projects for the deployment of RETs and carries out DOE-assigned program management;

- Serves as the "corporate memory" to assure that lessons learned are applied to the next generation of RET projects;
- Develops collaborative relationships with research institutes abroad, leading to a better understanding of, and familiarity with, U.S. manufacturers and products;
- Transfers RET and related technology from the Laboratory to U.S. industry; and
- Provides scientific and technical information on a wide range of RETs to other agencies and industry.

7. Los Alamos National Laboratory (LANL), New Mexico

LANL is a world class laboratory which attracts and retains a high caliber staff of 7,600. The Lab also continually draws internationally renowned scientists, both foreign and domestic, from universities, industry, and government-funded laboratories. LANL competencies and distinguishing characteristics include:

- ***Nuclear Weapons and Materials***: LANL has exceptional broad capabilities, with several unique facilities including the Plutonium Facility, the Chemistry and Metallurgy Research Building, and the Critical Experiments Facility. They permit research, development, and demonstration of process technology, fabrication, safety and criticality studies, and waste treatment. Explosive and energetic materials capabilities extend from synthesis and characterization to pilot scale production to machining and fabrication to engineering and testing. Flash x ray capabilities allow imaging of dynamic events.

- ***Scientific Computing***: LANL has one of the two largest capabilities in this area, a capacity that allows the Lab a leadership role in addressing some of the nations grand challenges. An example is development of the parallel ocean model, a program that received the Computerworld Smithsonian Award for technical excellence in the science category. LANL is the site of one of two DOE High Performance Computing Centers, and supports the Computational Testbed for Industry, as well as the Los Alamos Neutron Scattering Center (LANSCE), a pulsed neutron source with a large and vigorous user community. Research activities cover the spectrum from materials studies to structural biology, and LANSCE is expected to play a key role in the proposed nuclear weapons stewardship initiative.

- ***Sensors and Diagnostics***: LANL is a leader in developing techniques for capturing transient signals under extremes of temperature and pressure. Sensors and diagnostics have been deployed in environments from subsurface to oceans to space. These capabilities play an important role in the growing area of non and counterproliferation, a national program in which LANL is a leader.

- ***Biology***: LANL has one of three DOE Centers for Human Genome Studies, which has earned international stature deriving largely from the interface that has been achieved between researchers in biology and those from the physical sciences, computation, and the engineering sciences.

8. Oak Ridge National Laboratory (ORNL), Tennessee

ORNL is a world-class, wide-ranging scientific R&D institution thanks to its technical accomplishments, outstanding staff, extensive facilities, diverse programs, and broad collaborations. The 5,100-member ORNL staff represents an unusually wide range of disciplines, and includes 1,500 scientists and engineers. ORNL hosts more than 4,000 guest scientists per year, representing 250 companies and universities, as well as over 20,000 students and several hundred teachers. ORNL core competencies include:

- ***Energy production and end-use technologies***: ORNL is one of the world's premier centers for R&D on energy efficiency and supply technologies and on the economic, social and environmental consequences of energy systems and processes. The Buildings Technology Center has the nation's most versatile capability for testing and analysis of building equipment and envelope systems.

- ***Biological and environmental science and technology***: ORNL offers unique capabilities for investigating pathways, fate and effects of anthropogenic materials in the environment, and has the only formal Protein Engineering Program within DOE. The Mammalian Genetics Facility is a unique national resource for genetics research.

- ***Advanced materials synthesis, processing, and characterization***: An extremely broad range of materials R&D is conducted, with particular excellence in high temperature ceramics and composites, metals and intermetallic alloys, superconductors, semiconductors, optical materials, and surfaces and thin films. The High Temperature Materials Laboratory is a unique and popular user facility for materials research.

- ***Neutron-based science and technology***: This competency includes the design and operation of research reactors, accelerators, and hot cells; neutron scattering; isotope production and research, materials irradiation and testing, neutron activation analysis, radiation chemistry, health physics and radiation effects, and nuclear medicine. Unique facilities include the High Flux Isotope Reactor (HFIR) and Radiochemical Engineering Development Center (REDC).

Supporting these core competencies are facilities and capabilities unavailable elsewhere, such as the:

- Holifield Radioactive Ion Beam Facility,
- Center for Computation Science (one of two such DOE centers).

9. Pacific Northwest Laboratory (PNL), Washington State

PNL and its 4,000-member staff are located on the Hanford Site, a factor which heavily influences the Lab's technical composition. PNL entered the DOE Multiprogram Laboratory System in 1986, well-positioned to shift focus from support of defense production to environmental issues and cleanup. DOE and PNL management committed to establish a world-class fundamental science base in bioscience, chemistry, chemical physics and process science, directly related to the nation's environmental problems. PNL possesses three core competencies:

- ***Integrated Environmental Research***: Key technical capabilities are in the fields of ecological sciences, hydrology, geochemistry/geophysics, atmospheric chemistry, chemistry and chemical physics, bioscience, economics and policy analysis, and computational sciences. PNL offers a proven ability to form large cross-disciplinary teams to address large-scale environmental issues. PNL leads the OHER Subsurface Science Program, the Atmospheric Radiation Measurement Program of the DOE Global Environmental Change Research Program, and is constructing the Environmental and Molecular Science Laboratory (EMSL) as a national collaborative research facility.

- ***Process Science and Engineering***: As the science and technology integrator at Hanford, PNL leads in Hanford's Tank Waste Remediation System and the National Tanks Program -- bringing to bear long-standing process skills related to defense-waste storage, treatment and packaging technology. This competency is highly coupled with the integrated environmental research competency because remediation and storage performance criteria must be based on scientifically sound standards governing environmental and biological risk. Technical skills are focused on chemical and physical characterization, tank safety, separations science, waste form development and performance, and systems engineering.

- ***Energy Systems Development***: Energy Systems Development is underpinned both by technology, and economic and policy analysis expertise. Historically, PNL has played key research roles in regional power issues, energy policy analysis, and more recently in technical areas of residential and industrial power usage, and power transmission and distribution systems. Distinguishing characteristics are exemplified by excellence in scientifically based economic models to address energy, agricultural, and ecological policy issues relative to global and regional environmental change.

10. Sandia National Laboratories (SNL), New Mexico

Sandia is a systems engineering laboratory. It was created in 1949 to team industrial management and government experience in the design of deployable nuclear weapons as well as the surety and reliability of the nuclear weapons stockpile.

Sandia is located in Albuquerque, New Mexico, and in Livermore, California, with the New Mexico site being the larger facility. Sandia operates a wide variety of technical and user facilities, the collection of which constitutes one of the world's premier research, development, and testing complexes. The staff of 8,500 employees performs work for DOE national security programs (about 50% of laboratory effort), DOE energy and environmental programs (about 25%) and work for other federal agencies (25%). Ninety percent of the work for other federal agencies is for DoD.

Sandia's core competencies include the following research foundations and integrated capabilities:

Research Foundations:

- ***Engineered Processes and Material***: The synthesis, characterization, and processing of metallic, ceramic, organic, and composite materials; advanced materials and processes tailored for specific applications.

- ***Computational and Information Sciences***: The development of advanced computing networks, computational methods for emerging computer technologies, mathematical techniques for information surety, and computer-based techniques for intelligent machines.

- ***Microelectronics and Photonics***: Materials growth and development, device design, fabrication technologies for silicon and compound semiconductor devices, and design of processes and equipment for the manufacture of integrated circuits.

- ***Engineering Sciences***: Fluid and thermal sciences, solid and structural mechanics, radiation transport, aerospace sciences, geoscience, combustion science, and the development of interdisciplinary capabilities.

Integrated Capabilities:

- ***Advanced Manufacturing Technology***: Leadership in advanced manufacturing to make continuing, critical, and valuable contributions to national security, energy security, environmental stewardship, and economic competitiveness.

- ***Electronics Technology*:** Leadership in electronics technology for defense and industry.

- ***Advanced Information Technology*:** Technology and systems for nuclear weapon programs, related mission assignments, other strategic thrusts, and national information initiatives.

- ***Pulsed Power Technology*:** High-power x-ray and gamma ray sources for a variety of applications, including nuclear weapon survivability testing, light-ion beam inertial confinement fusion, materials processing, waste and product sterilization.

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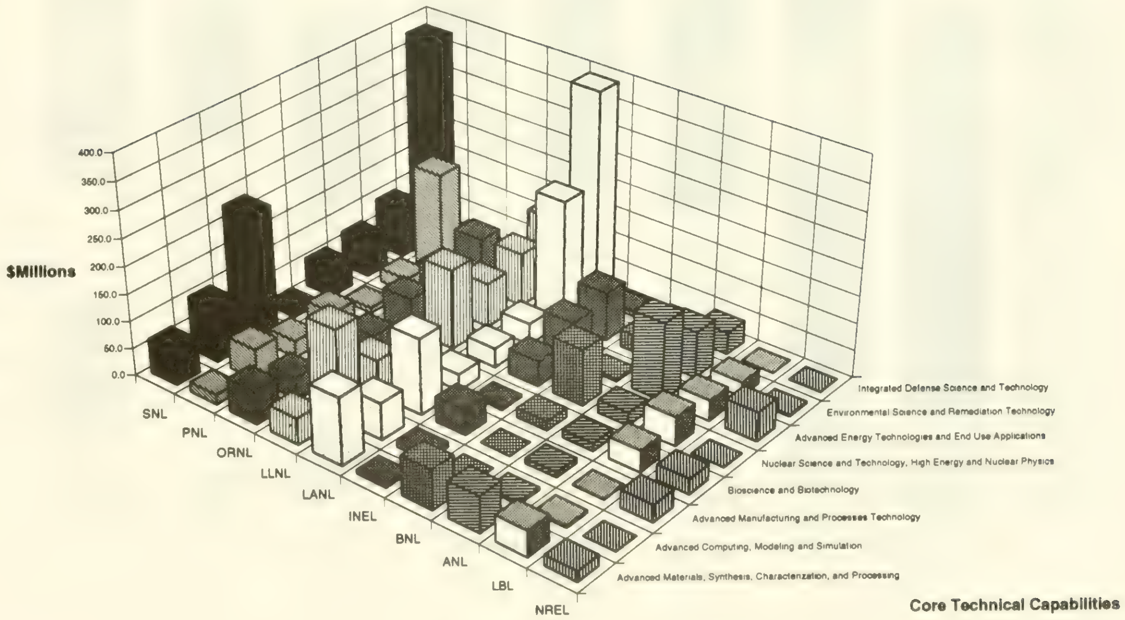
Operating Dollars
(FY93)



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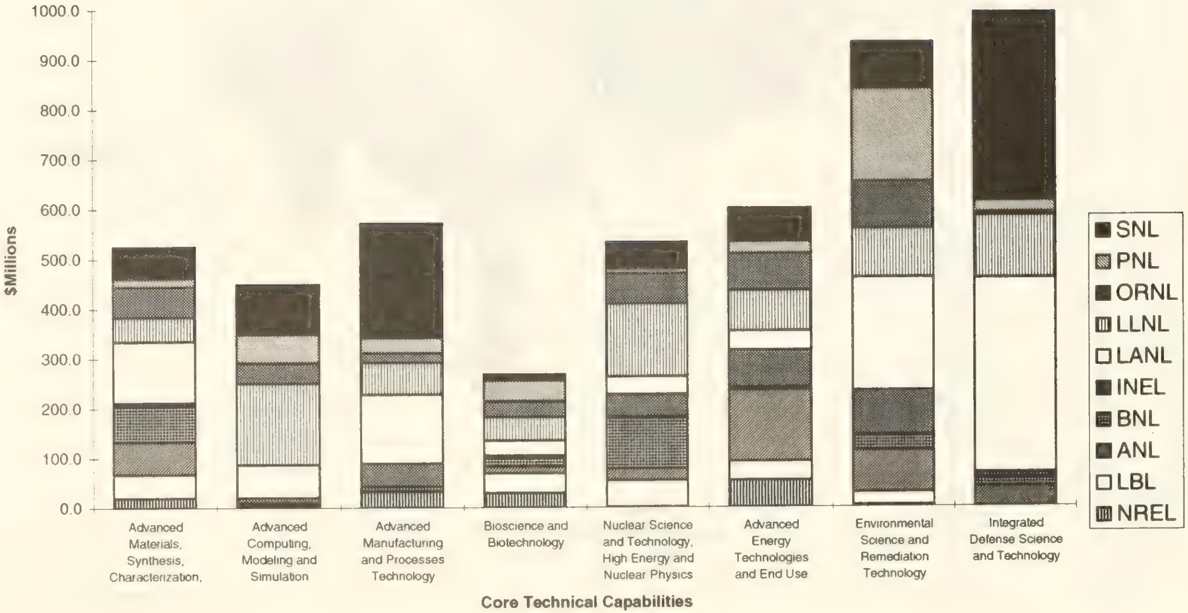

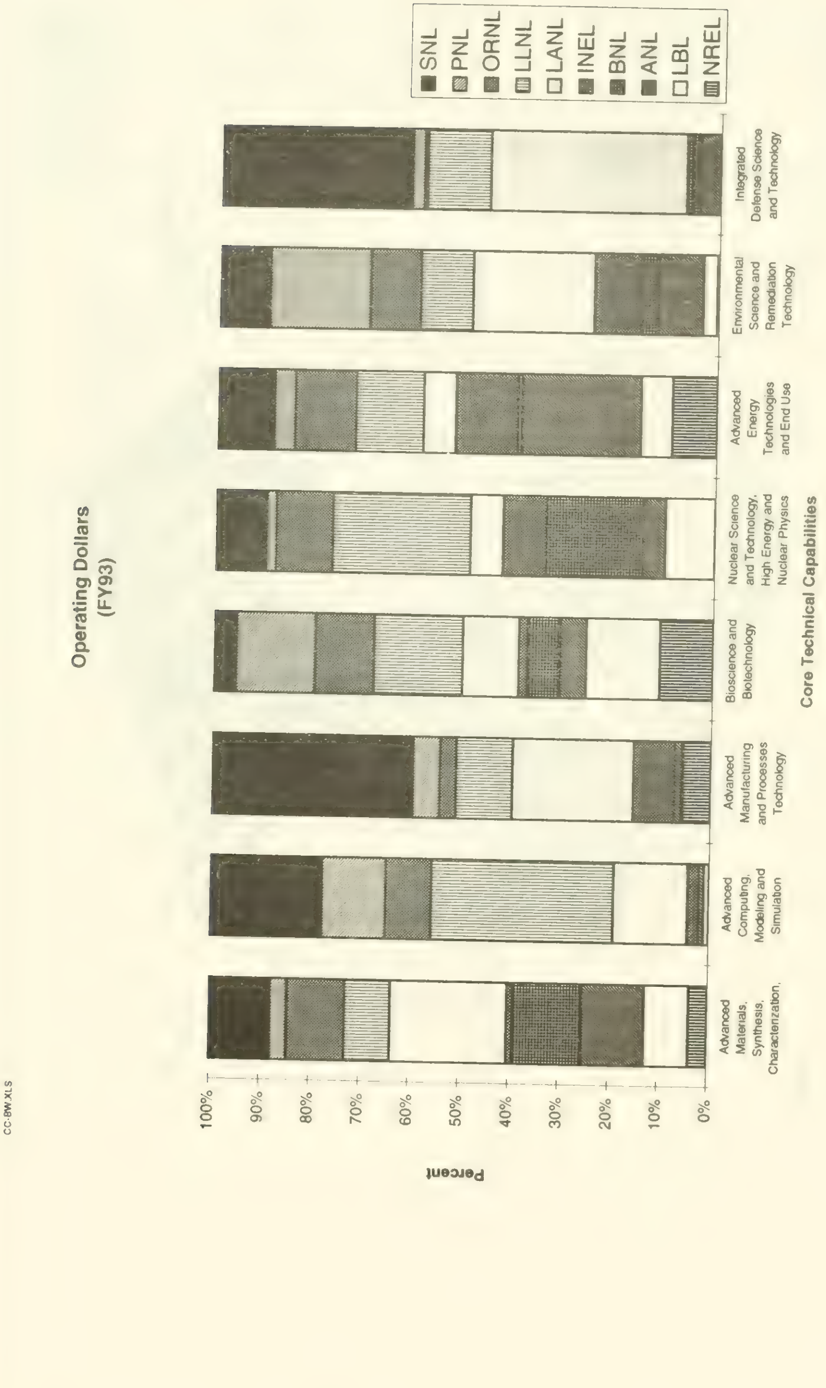
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NREL
Advanced Materials, Synthesis, Characterization,
Advanced Computing, Modeling and Simulation
Advanced Manufacturing and Processes Technology
Bioscience and Biotechnology
Nuclear Science and Technology, High Energy and Nuclear Physics
Advanced Energy Technologies and End Use
Environmental Science and Remediation Technology
Integrated Defense Science and Technology
Core Technical Capabilities
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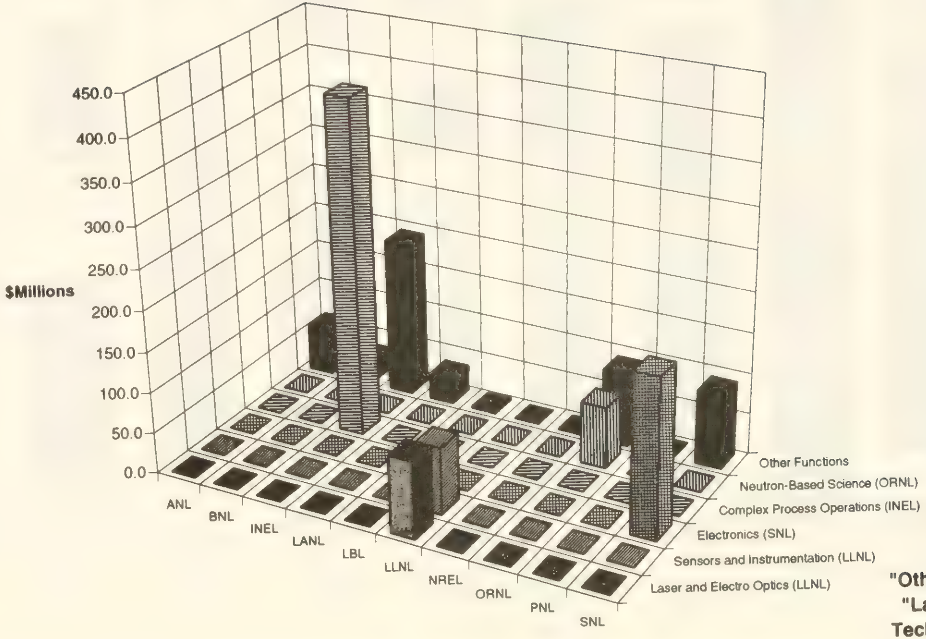

**"Other" Functions and
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Technical Capabilities**

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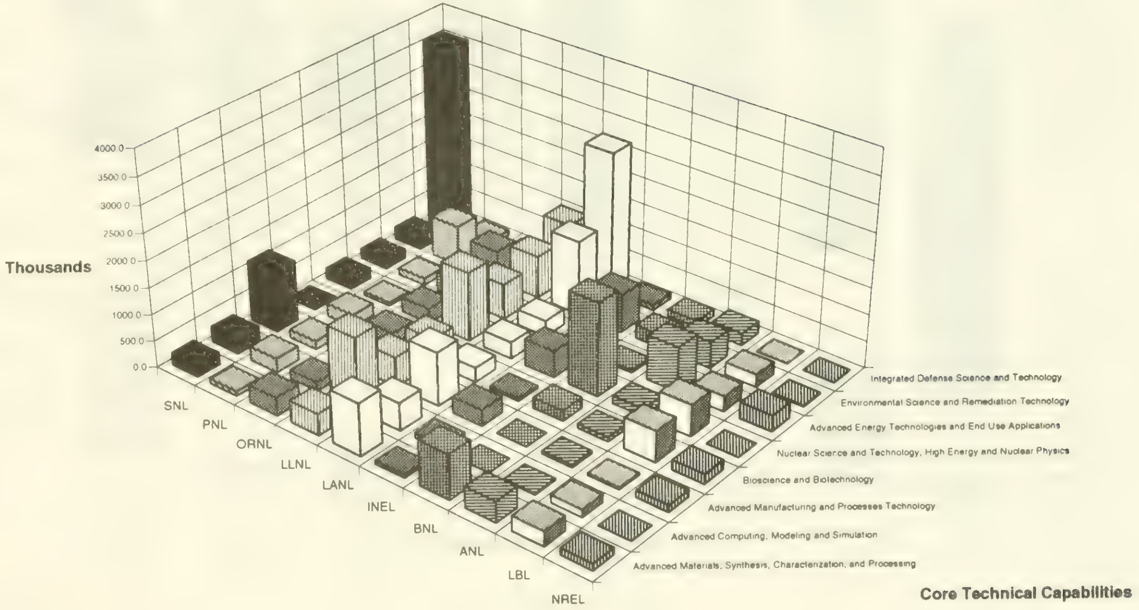
Full-Time Equivalent Employees
(FY93)



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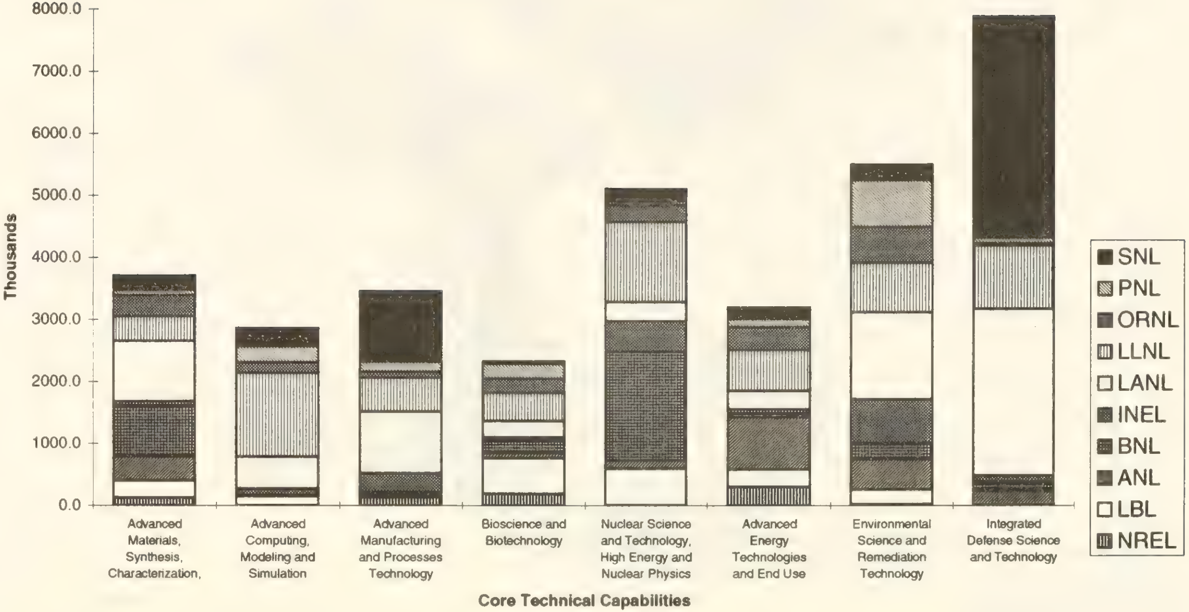

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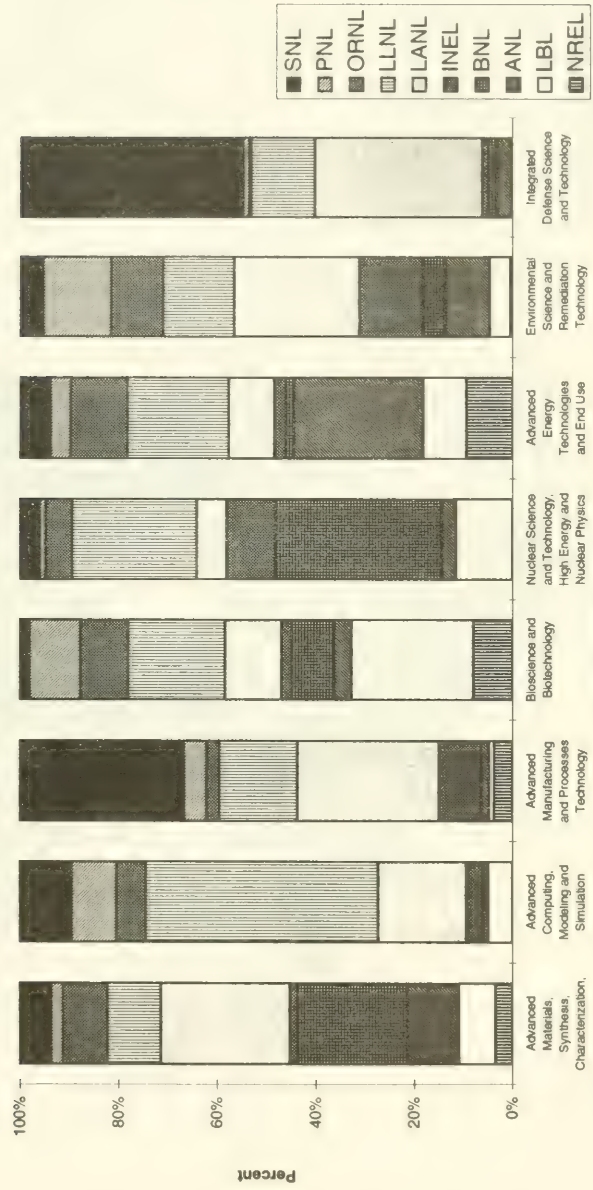

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Full-Time Equivalent Employees
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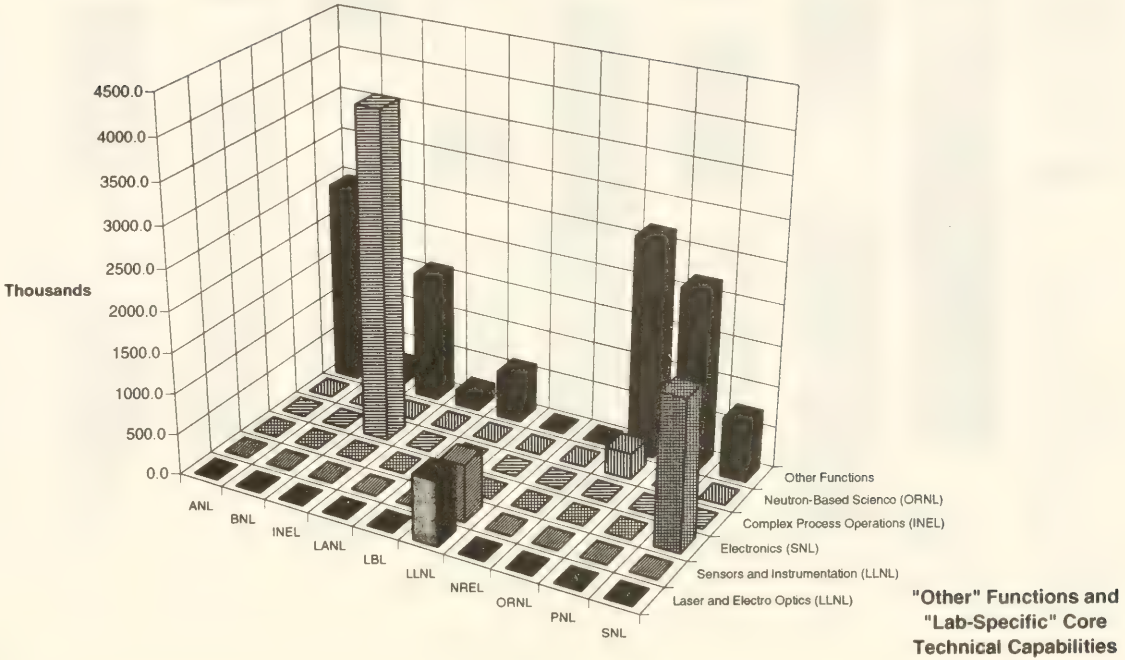

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Replacement Cost of Facilities Valued at Greater than $25M
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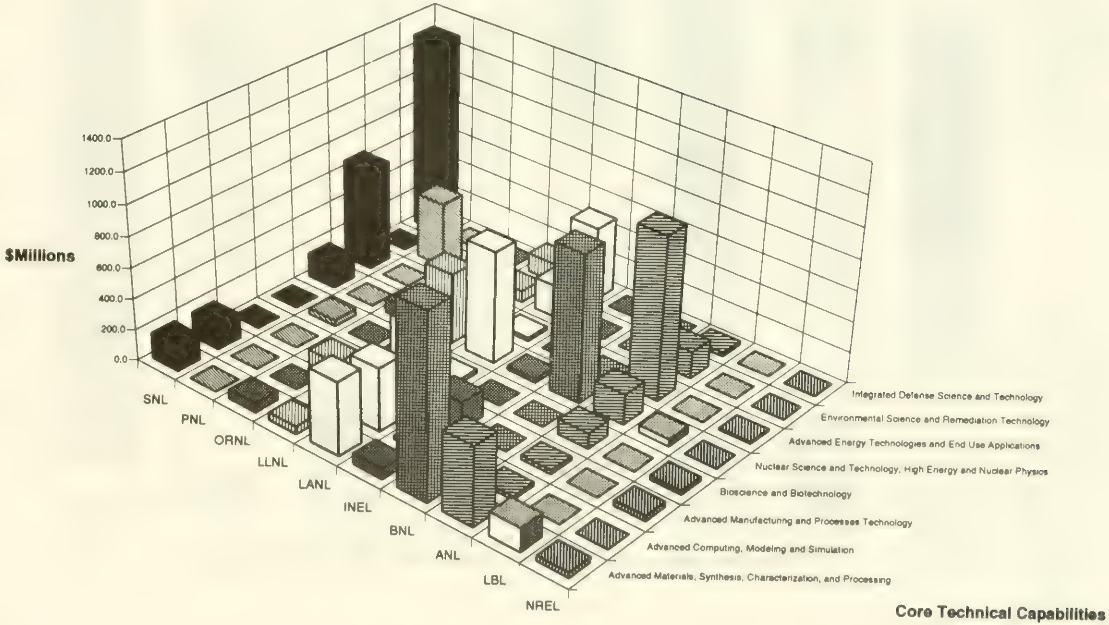

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Replacement Cost of Facilities Valued at Greater than $25M
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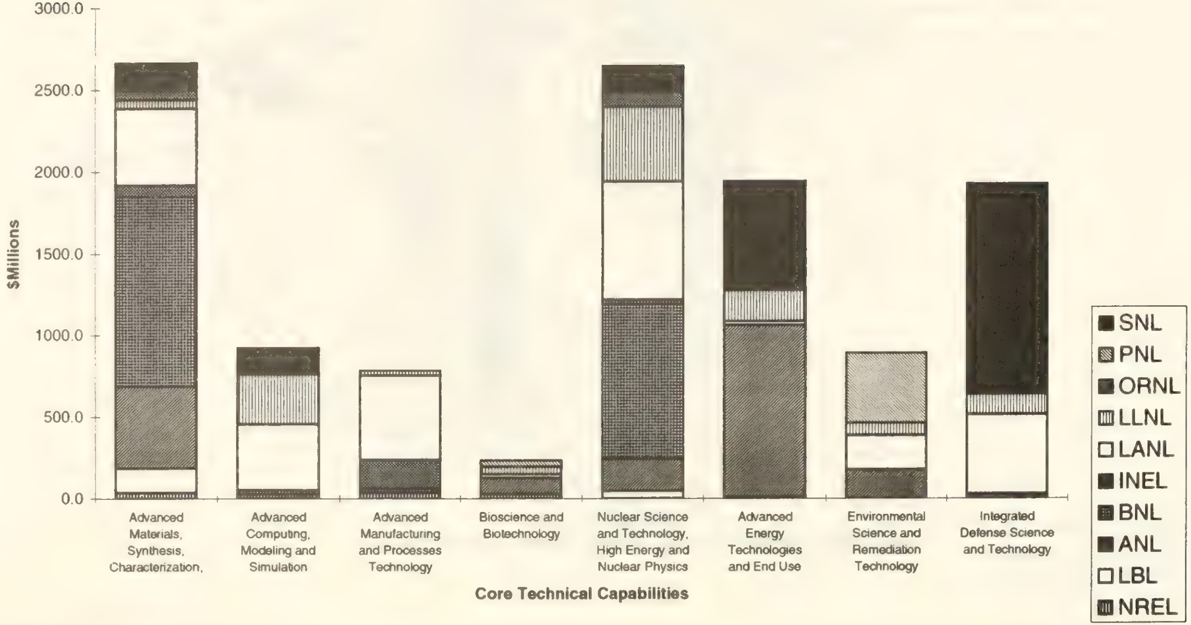

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Replacement Cost of Facilities Valued at Greater than $25M
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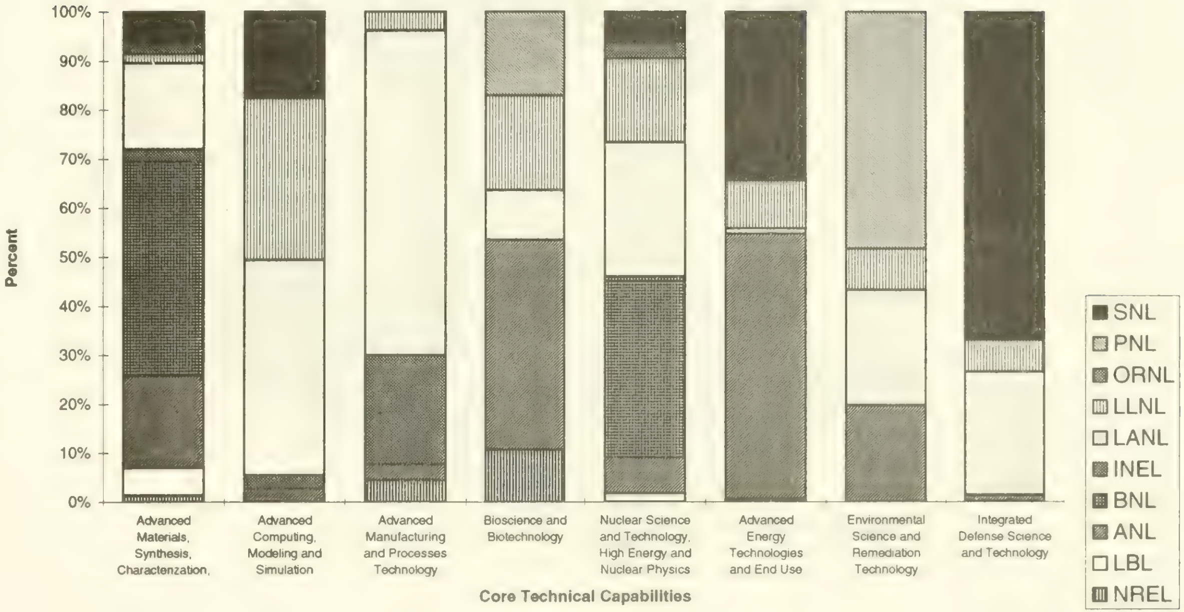

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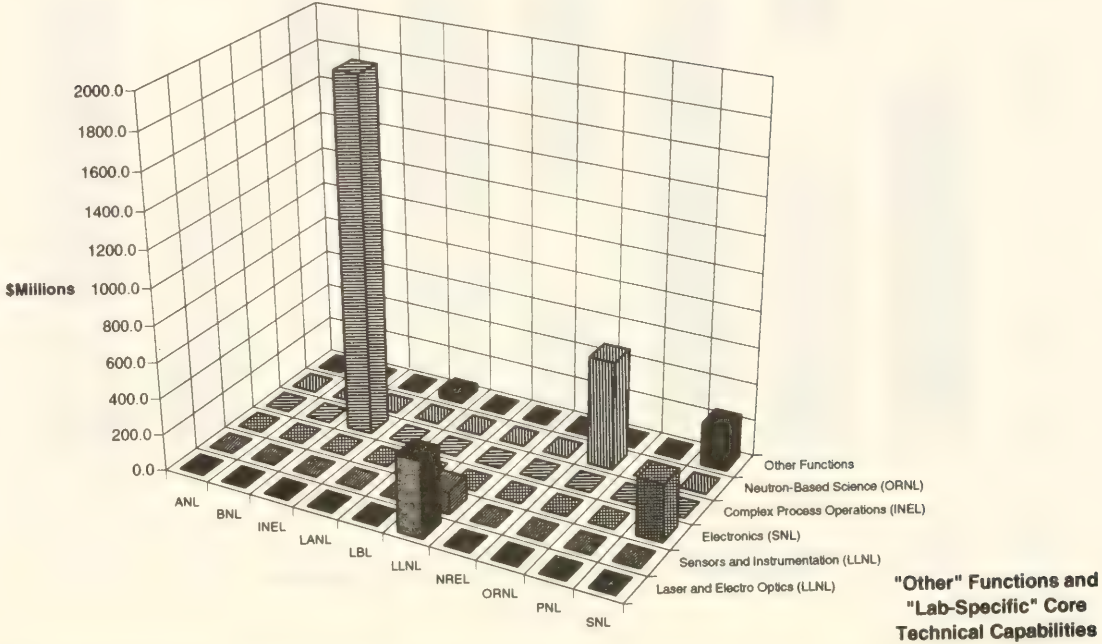

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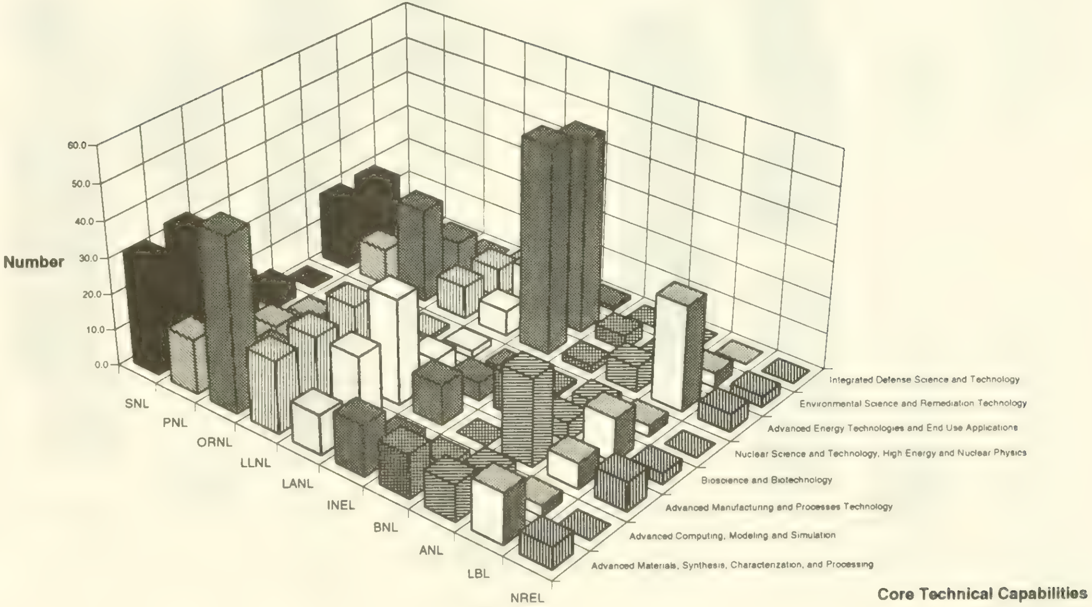

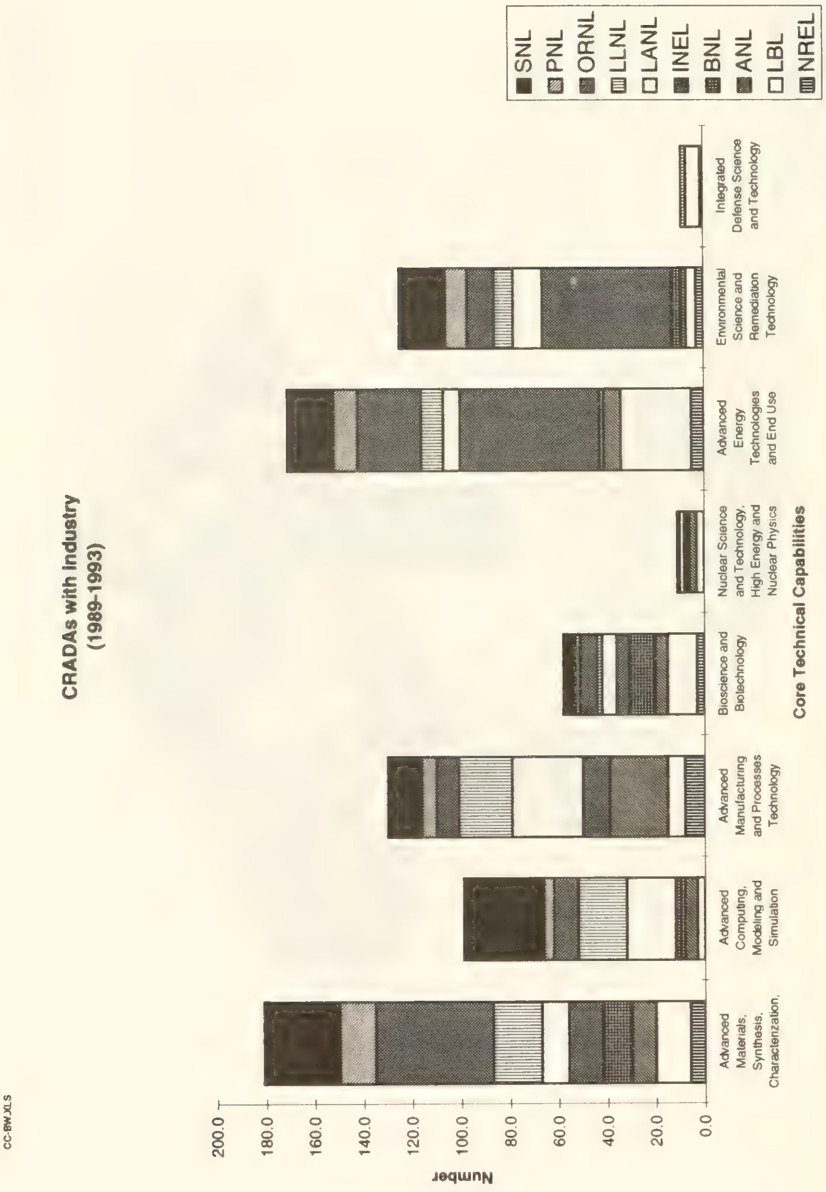
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Advanced Computing, Modeling and Simulation
Advanced Manufacturing and Processes Technology
Bioscience and Biotechnology
Nuclear Science and Technology, High Energy and Nuclear Physics
Advanced Energy Technologies and End Use
Environmental Science and Remediation Technology
Integrated Defense Science and Technology
Core Technical Capabilities
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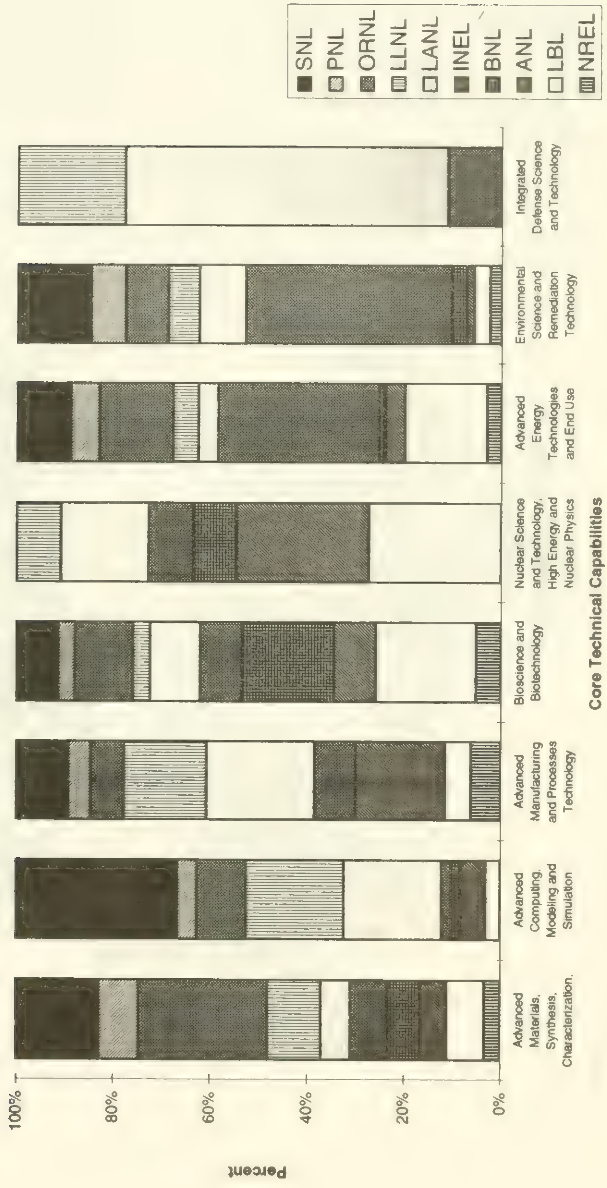
CRADAs with Industry (1989-1993)



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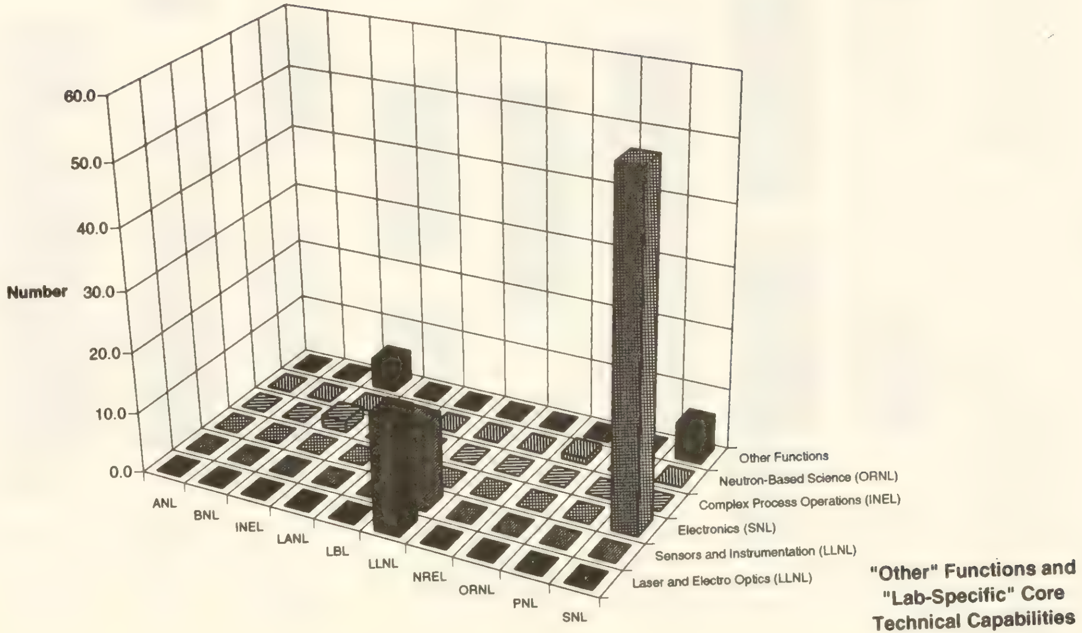

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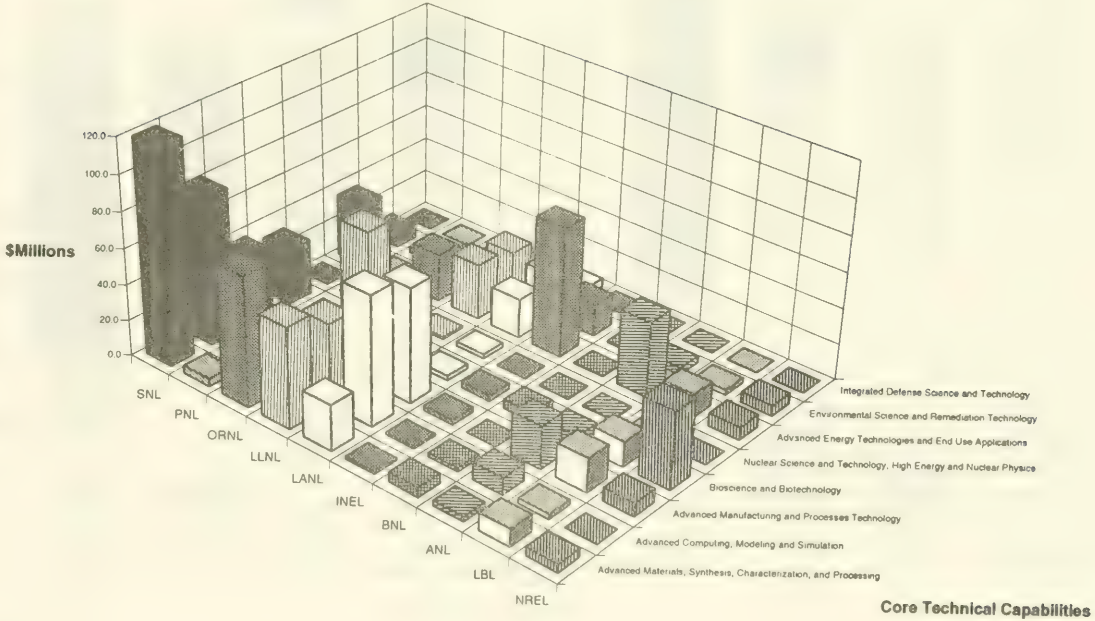
Value of CRADAs with Industry
(FY93)



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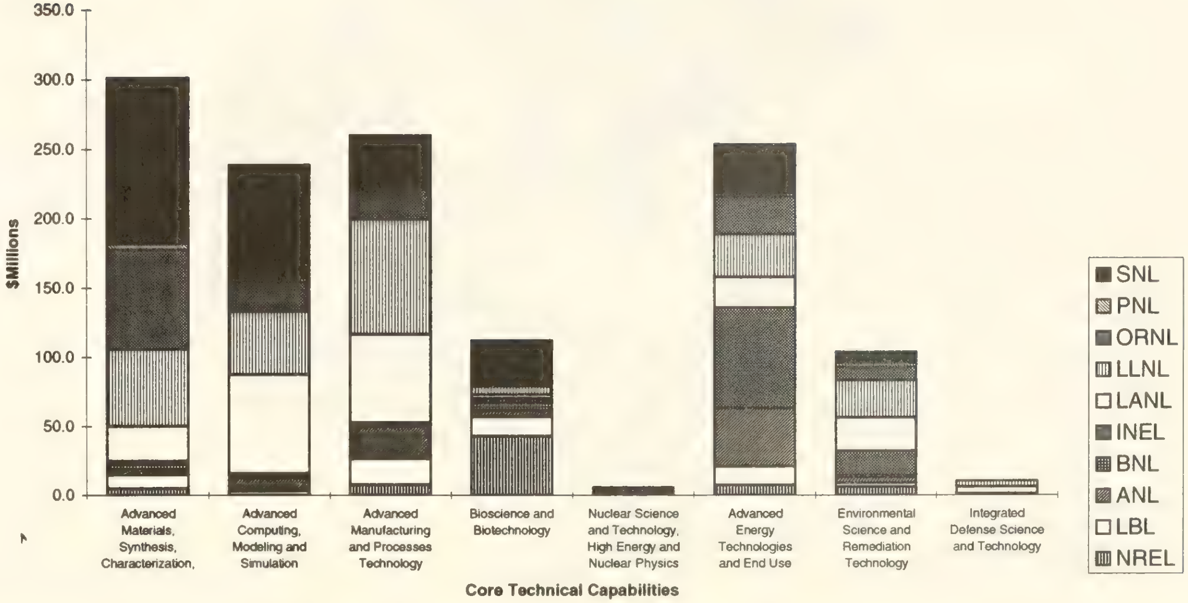

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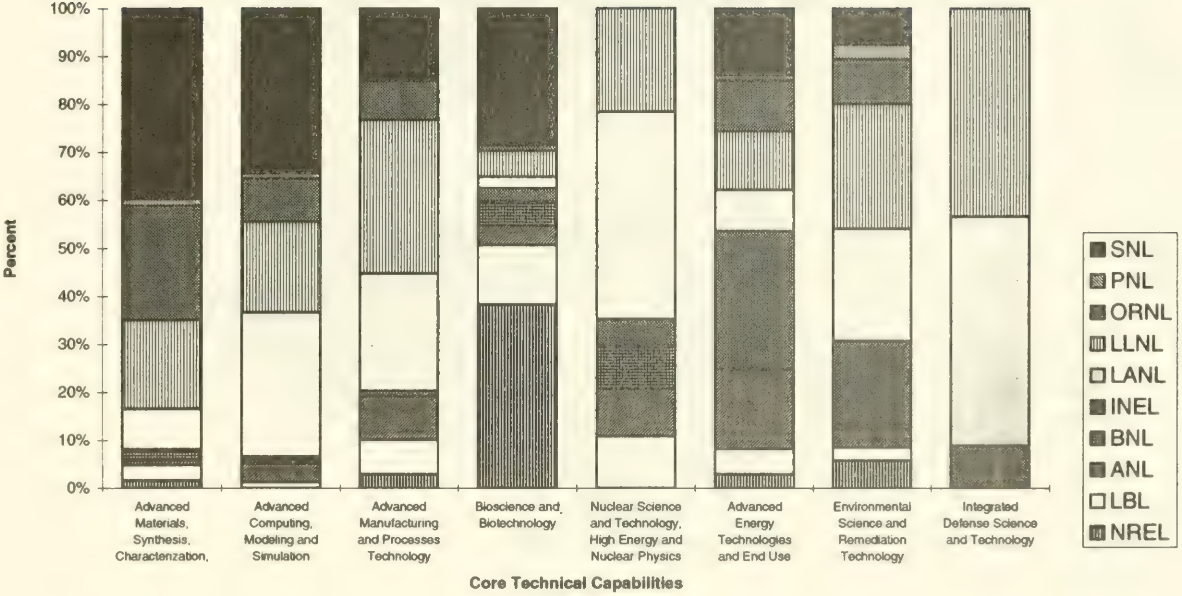

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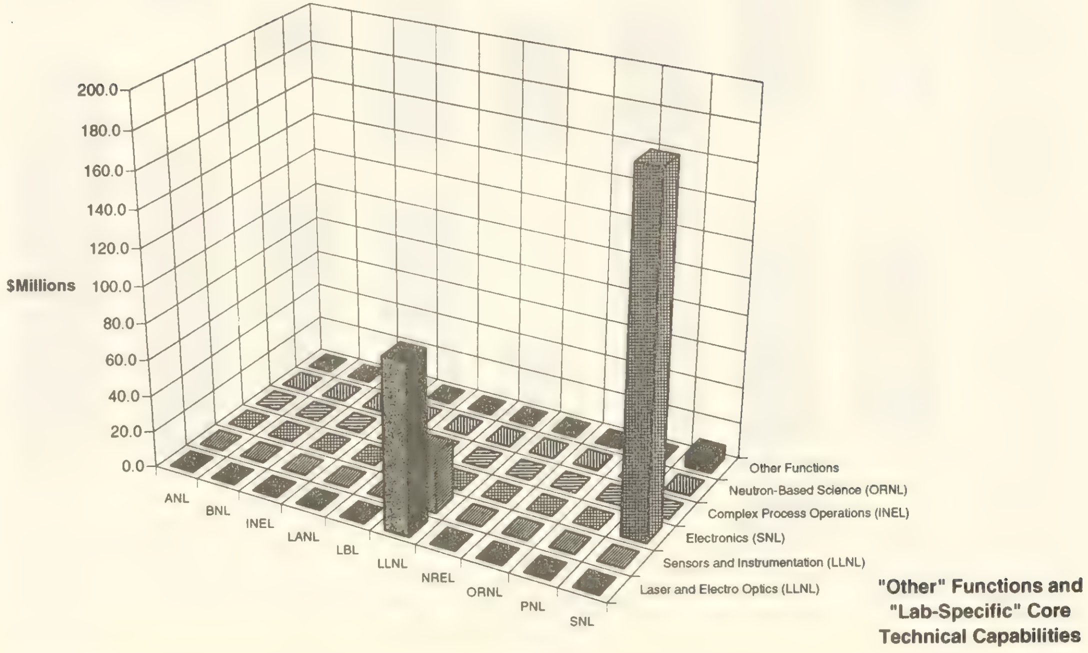

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Patents and Licenses
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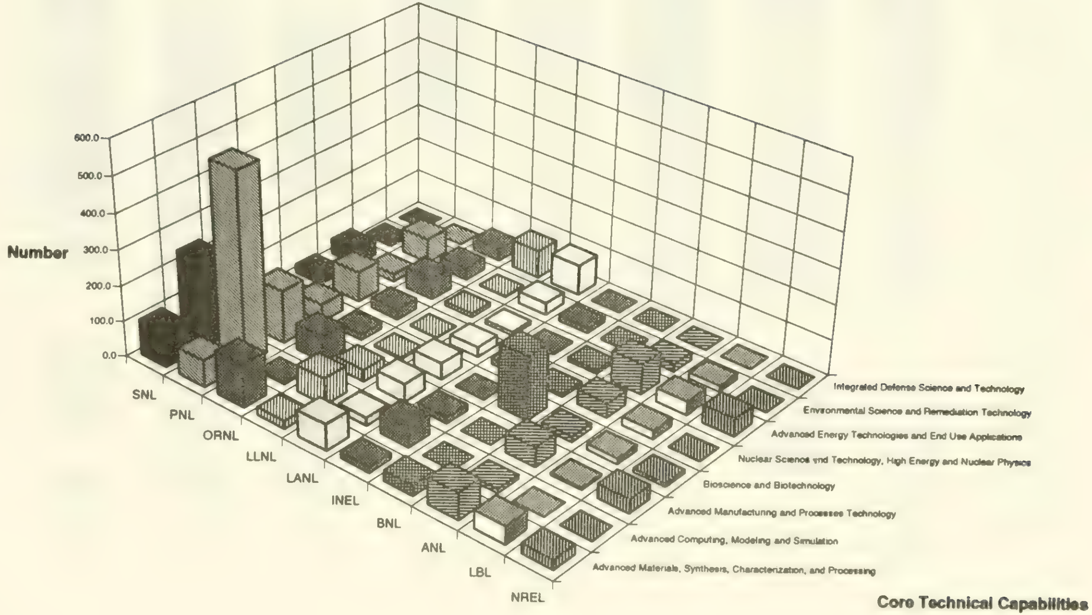

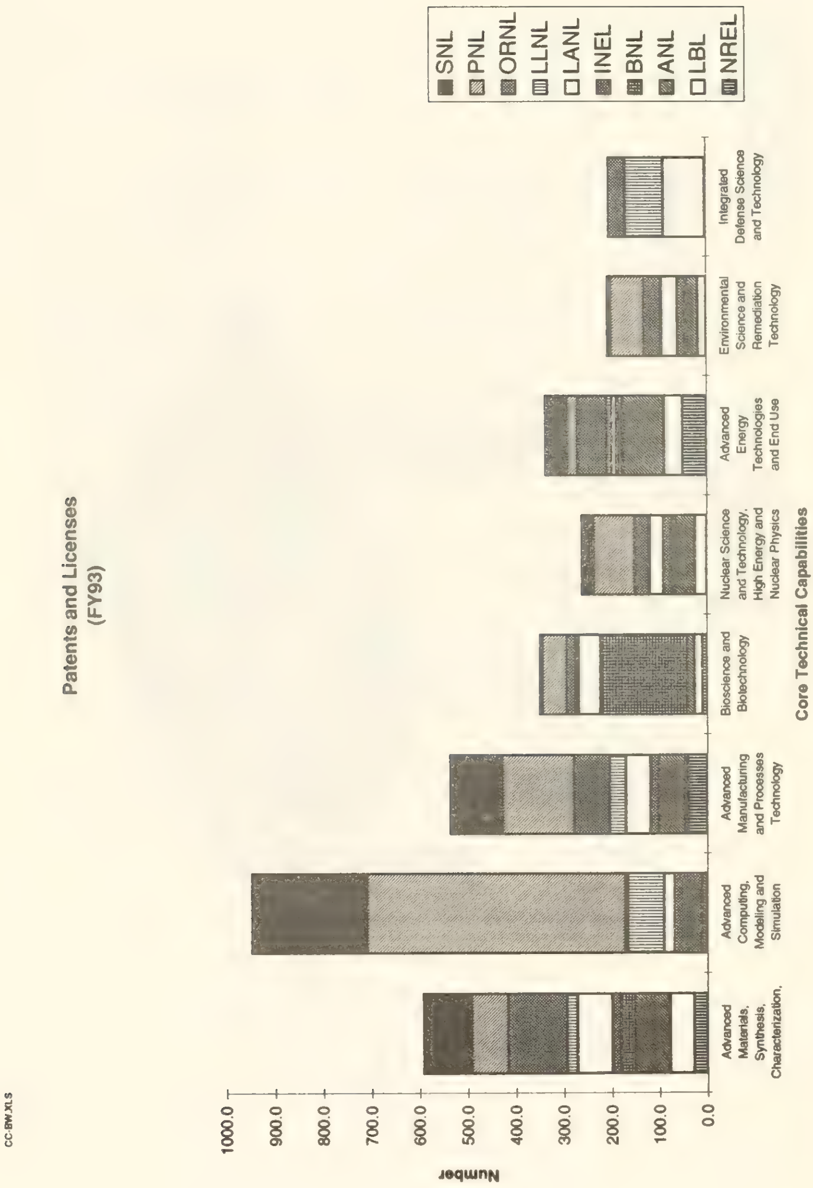
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Advanced Manufacturing and Processes Technology
Bioscience and Biotechnology
Nuclear Science and Technology, High Energy and Nuclear Physics
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Environmental Science and Remediation Technology
Integrated Defense Science and Technology
Core Technical Capabilities
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Patents and Licenses
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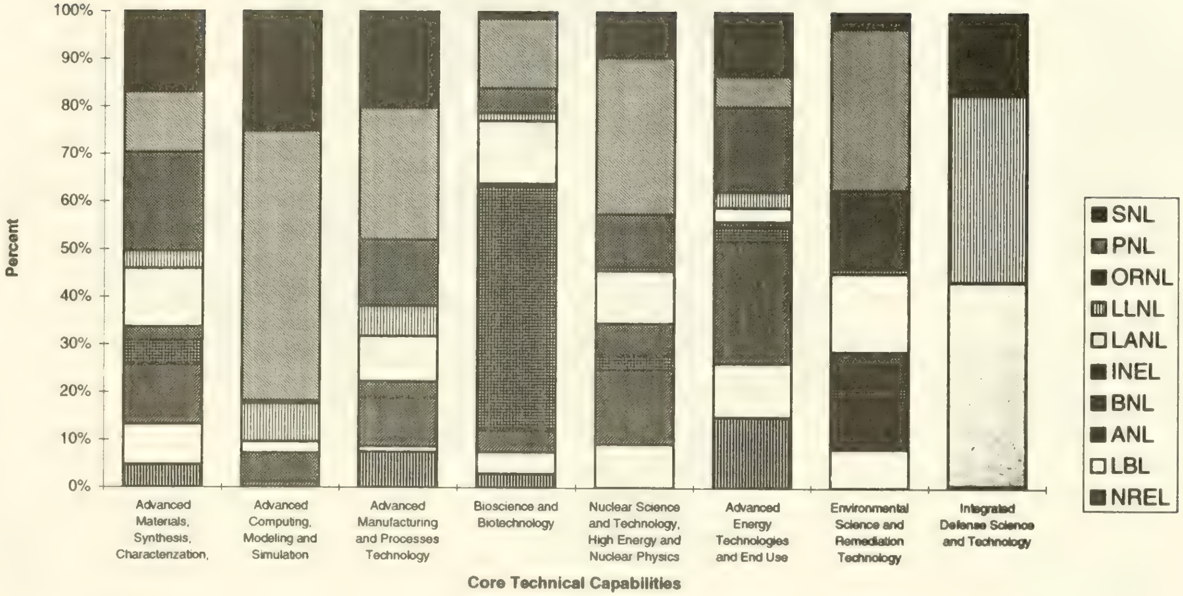

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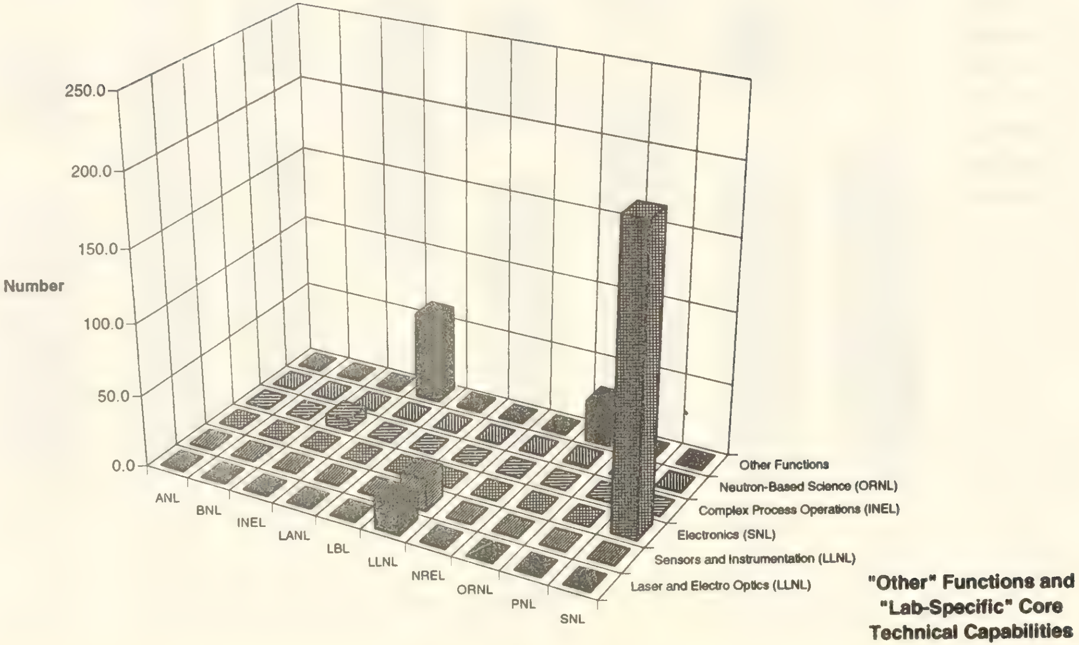

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R&D 100 Awards
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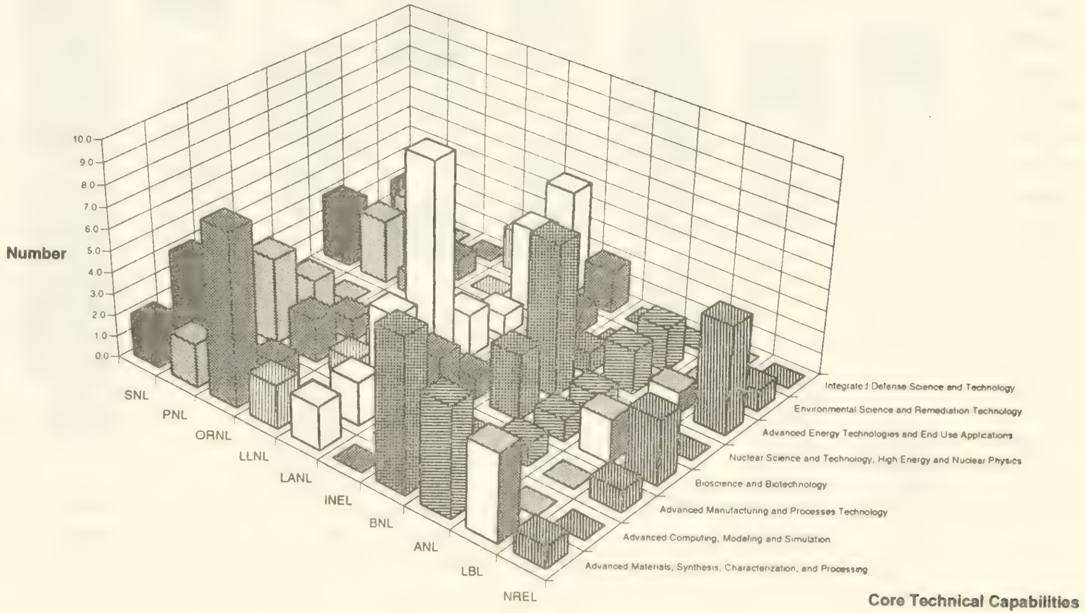

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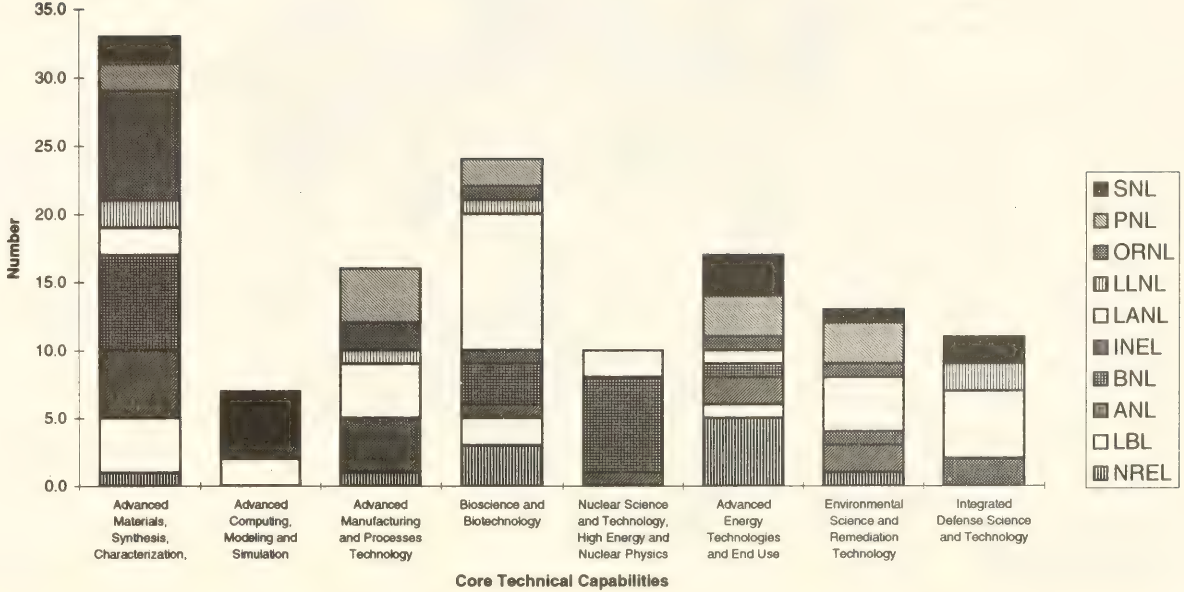
R&D 100 Awards
(FY89-93)



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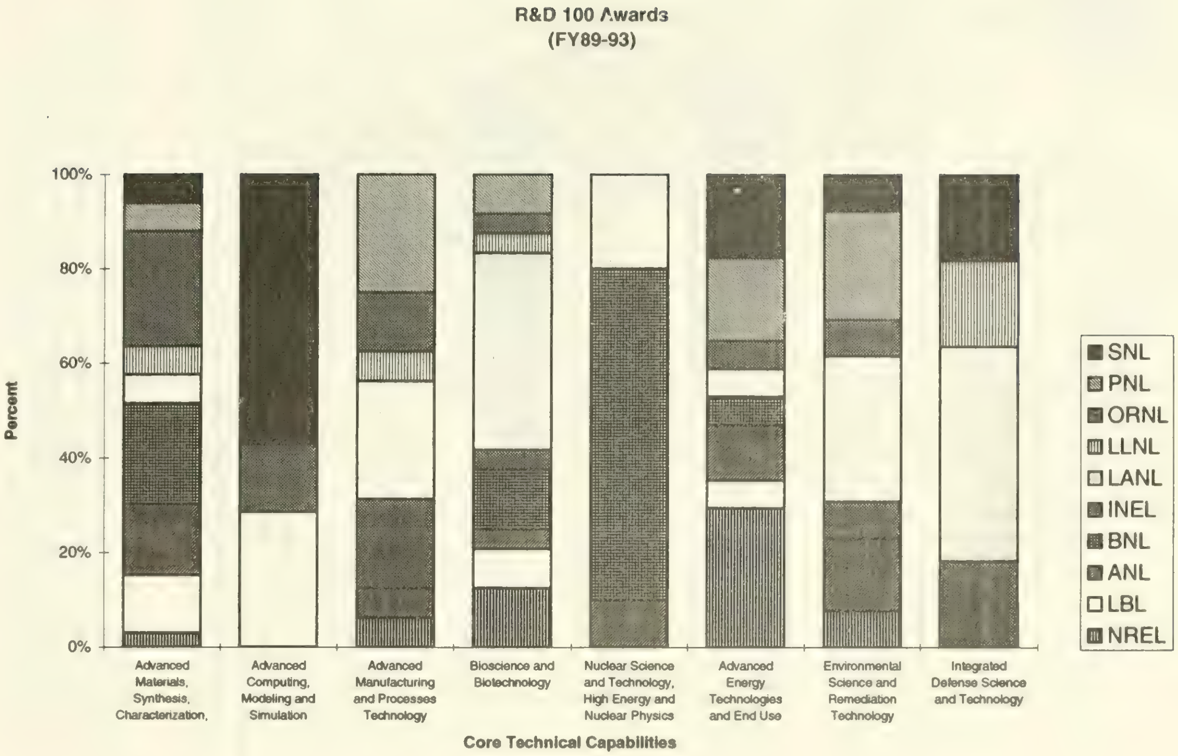

R&D 100 Awards
(FY89-93)

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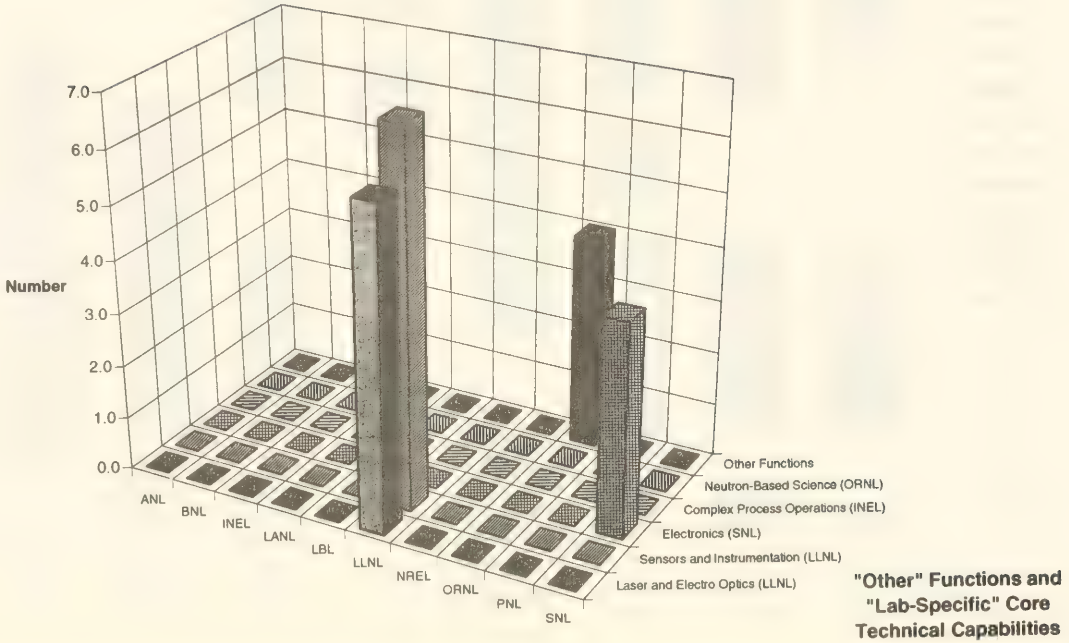
R&D 100 Awards
(FY89-93)



The Secretary of Energy
Washington, DC 20585

Response by Secretary Hazel R. O'Leary to the Final Report of the Task Force on Alternative Futures for the Department of Energy National Laboratories

February 1, 1995

With the benefit of the past day to fully review the Task Force report, these are my initial observations. We will develop a more detailed response during the period of public comment, which ends February 15. Our full analysis and implementation plan will be submitted to the National Science and Technology Council by March 7, 1995, for inclusion in a report to the President that will address the laboratories of the Department of Energy, Department of Defense and NASA. That report is due April 15, 1995.

When I initiated this study one year ago, I commissioned a fiercely independent group to provide tough scrutiny of the DOE laboratories. Under the leadership of Bob Galvin, and the Task Force members who have given fully of their time, the Nation now has an ambitious set of proposals regarding the future of these institutions. I wanted recommendations that challenged the Department and its laboratories to reach new levels of performance in meeting national needs. To a large extent, the Task Force has met these expectations.

It is clear to me that the Department will be able to embrace and aggressively act on the overwhelming majority of the Task Force's recommendations. These recommendations will provide the means for a more efficient and cost-effective DOE laboratory system than ever before. Much will be required of the Department and its labs in responding to this report.

The Task Force has clearly and forcefully validated the importance of the major R&D missions of the Department and its laboratories. Words like 'vital,' 'urgent,' 'critical,' and 'important' are used throughout the report in describing the research agendas of the DOE laboratories in the areas of energy, environment, national security, and fundamental science.

We welcome the Task Force's bullish stance on the Department's fundamental science mission and share the Task Force's view that "the laboratories' research role is part of an essential, fundamental cornerstone for continuing leadership by the United States." We also share the view that energy and environmental R&D at the labs must be more closely integrated.

We are pleased by the Task Force's support for the Department's science-based stockpile stewardship program, including support for construction of the National Ignition Facility. The Department will closely evaluate the recommendations regarding a reduction of some of the nuclear weapons functions at Lawrence Livermore and their transfer to Los Alamos. I have an initial favorable disposition for a careful phase-down of some of Livermore's nuclear weapons work, combined with a re-emphasis on non-proliferation, counter-proliferation, and verification activities.

The Task Force makes a persuasive case that the laboratories, working with the Department, should sharpen their strategic focus on areas of established excellence, and not venture off in search of major new missions. The general message is that federal institutions must borrow a page from the private sector, where companies are achieving major performance improvements by consolidating around their essential strengths. We have already begun the necessary process through our strategic planning and Strategic Alignment initiatives, which will gain momentum with the five-year, $10.6 billion DOE budget reduction announced in December. Through these efforts, we will sharpen the focus of the laboratories on their distinctive and world-class capabilities and help guide the Department's decisions regarding laboratory downsizing and the elimination of lower quality functions.

The Task Force includes a critical assessment of the Department's Environmental Management program. This program lies largely outside the scope of the laboratories. As such, I do not believe that sufficient effort was made by the Task Force to develop a full understanding of the strides we have made in directly addressing problems we inherited from the past. Over the past two years, we have worked to assess and to quantify the vulnerabilities at each site and have established both a national advisory board--which includes world-class scientists--and a host of site-specific advisory boards. We have taken--and are continuing to take--bold actions to cut costs, reinvent the program, and accelerate clean-up activities. We already have successfully implemented several of the Task Force's recommendations in this area. We agree that the science and technology base must be greatly expanded for this program. In our view, cost and performance of the labs vis-a-vis industry and academia must drive decisions regarding their relative roles in the development of clean-up technologies.

The Task Force concludes that Industrial Competitiveness is not an appropriate primary mission of the laboratories. We agree. It has always been our intention that collaborations with industry be viewed as a derivative and critical success indicator of our other missions. Through its partnerships with industry, the Department helps to maximize the value of the public investment in these institutions by increasing the prospects of getting taxpayer-financed innovations to the marketplace, while also meeting DOE mission requirements. The Task Force's concludes that industrial collaborations at the labs should be tied to core DOE mission areas, and they acknowledge that we already are implementing this approach.

The Department concurs that the existing system of management of the laboratories is costly, bureaucratic, and inefficient--due to a 40-year legacy of creeping micromanagement and uncoordinated and excessive oversight of the labs by Congress, the Department, and multiple review bodies. DOE orders are excessive, redundant and vague. This report provides new urgency to our efforts, already well underway, to reduce and eliminate DOE orders and to strip away non-value-added layers. We are eager to work with the labs, Congress, the General Accounting Office, and others on ways to achieve dramatic improvements in the cost-performance of these institutions, while also meeting environmental, safety, health, and fiscal accountability requirements established by statute.

Responding to my request for alternate management schemes, the Task Force recommends a new and innovative governance structure for the laboratories. The proposal would be an unprecedented approach, and thus we will need to learn much more about its potential benefits and liabilities. We will ask the full Secretary of Energy Advisory Board to assist in further assessing this proposal and its implications.

The bottom line: I welcome the Task Force's report and am heartened by their strong validation of the R&D functions of the Department and its National laboratories.

Secretary of Energy Advisory Board
Washington, DC 20585

February 1, 1995

Memorandum

From: Pete Didisheim
Executive Director

Subject: Report on the Department of Energy Laboratories

Enclosed is a copy of the Report of the Task Force on Alternative Futures for the Department of Energy National Laboratories. This Task Force was established by Secretary of Energy, Hazel R. O'Leary, in February 1994, and was asked to conduct a searching review of the DOE laboratories and to develop recommendations on how the nation might best utilize these R&D institutions to meet future national needs. Chaired by Robert Galvin, Chairman of the Executive Board of Motorola, the Task Force has become known as the "Galvin Task Force."

This report was presented to the full Secretary of Energy Advisory Board during a plenary session in Washington, D.C. on February 1, 1995. Public comments may be submitted until February 15, 1995, to the attention of Dr. Michele Donovan; Secretary of Energy Advisory Board; U.S. Department of Energy; Room 8E-050; Washington, D.C. 20585.

The report will be formally transmitted to the Secretary of Energy by the Chairman of the Secretary of Energy Advisory Board before the end of February. During the public comment period and through the month of February, the Department will develop a full analysis and implementation plan. By March 7, 1995, a final report will be submitted by the Department to the National Science and Technology Council (NSTC). Similar reports are under development by the Department of Defense and NASA, and the NSTC will integrate reports on all three agencies into a Report to the President, which is due April 15, 1995.

Volume II of the report contains a series of White Papers that were developed by the Department of Energy and provided to the Galvin Task Force during the process of their study. These white papers provide additional detailed information about the ten DOE laboratories that were under review by the Galvin Task Force.

United States General Accounting Office

GAO

Report to the Secretary of Energy

January 1995

DEPARTMENT OF ENERGY

National Laboratories Need Clearer Missions and Better Management

GAO/RCED-95-10

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-170004

January 27, 1995

The Honorable Hazel R. O'Leary
The Secretary of Energy

Dear Madam Secretary:

This review of the national laboratories is part of our general management review of the Department of Energy. The purpose of this review is to assess the Department's management, analyze problems and determine their underlying causes, and identify ways of improving departmental management processes and structures.

This report contains recommendations to you for improving the effectiveness of the Department's multiprogram national laboratories. As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement of the actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Reform and Oversight not later than 60 days after the date of this letter and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of this letter.

We are sending copies of this report to interested congressional committees and subcommittees; individual Members of Congress; and other interested parties. We will also make copies available to others upon request.

Please contact me on (202) 512-3841 if you have any questions. Major contributors to this report are listed in appendix IV.

Sincerely yours,

Victor S. Rezendes
Director, Energy and
Science Issues

Executive Summary

Purpose

The Department of Energy's (DOE) multiprogram national laboratories have made vital contributions to the nation's defense and civilian science and technology efforts. Now, these laboratories face many changes as the nation redefines its defense requirements at the end of the Cold War and encounters increasing global competition in technology. These changes have raised questions about whether the laboratories are focusing their resources on the most important national priorities and are managed as effectively as possible.

As part of a general management review of DOE, GAO, with assistance from a panel of experts, assessed the laboratories' current and future missions and DOE's management of the laboratories.

Background

DOE's laboratories have combined annual budgets of about $6 billion and over 50,000 employees. DOE estimates that it has invested over $100 billion in the laboratories over the past 20 years. Most of the laboratories were established during or just after World War II as part of the Manhattan Project, which developed the world's first atomic bombs. The laboratories have since expanded their missions to encompass civilian research and development in many disciplines—from high-energy physics to advanced computing—at facilities located throughout the nation. The laboratories support DOE programs and address national needs in science and technology. DOE owns the laboratories but contracts with universities and private-sector organizations for their management and operation.

Results in Brief

DOE's laboratories do not have clearly defined missions that focus their considerable resources on accomplishing the Department's changing objectives and national priorities. As the manager of this important research and technology network, DOE has not coordinated these laboratories' efforts to solve national problems but has managed each laboratory on a program-by-program basis. As a result, DOE has underutilized the laboratories' special talents to tackle complex, cross-cutting issues, and the laboratories may not be prepared to meet future expectations. Although government advisory groups have recommended in the past that DOE redefine the laboratories' missions to meet changes in conditions and national priorities, DOE has not acted on these recommendations. DOE recently developed a Strategic Plan intended to integrate its missions and programs in five major areas, but questions remain about the Department's ability to lead the laboratories into the future.

DOE's day-to-day management of the laboratories—perceived as costly and inefficient by laboratory managers—inhibits the achievement of a productive working relationship between the laboratories and DOE that is necessary if the laboratories are to move successfully into new mission areas. Both laboratory and DOE managers believe that more realistic and consistent priorities are needed to accomplish the growing oversight and administrative requirements placed on the laboratories in recent years.

Principal Findings

Laboratories Need Clear and Coordinated Missions

Over the past decade, several government advisory groups have emphasized the need for DOE to clarify the laboratories' missions. Recent events—including dramatic changes in the nuclear arms race, the demand for technology to solve massive environmental problems, and the growing international competition facing U.S. industry—have brought this need into even sharper focus. Taxpayers have invested heavily in the laboratories, and DOE is responsible for ensuring that this investment is properly focused on national priorities.

The laboratories' missions are set forth as broad goals and activity statements rather than as a coordinated set of objectives with specific implementation strategies for bringing together the individual and collective strengths of the laboratories to meet departmental and national priorities. Faced with a "loss of coherence and focus" at the laboratories, as a 1992 energy advisory group reported, DOE has failed to develop a coordinated and shared "vision" for them. Laboratory managers fear that the lack of proper departmental direction is compromising both their effectiveness in meeting traditional missions and their ability to achieve new national priorities.

Part of the problem is that while DOE manages the laboratories program by program, it does not also manage them as a diversified research system. This approach prevents the laboratories from fully capitalizing on one of their great strengths—combining multidisciplinary talents to solve complex, cross-cutting issues. For example, research on preventing weapons proliferation requires combining expertise in nonproliferation and weapons design—activities that are carried out by different laboratories and managed by different assistant secretaries. The laboratories believe that better linkages are also needed among the energy conservation, fossil fuel, and nuclear energy research areas.

The need for a mechanism to facilitate cross-program coordination has been cited by past advisory groups and by GAO. DOE did create the Office of Laboratory Management to coordinate the interests of the various program offices that interact with the laboratories. However, the change was not implemented, and the existing office lacks the authority to resolve disputes among program offices and reports through two chains of command below the Secretary—an arrangement that does not promote effective interaction between DOE and the laboratories.

DOE created an Advisory Board Task Force on Alternative Futures for the National Laboratories, giving the Secretary another opportunity to chart a course for the future of the laboratories. The task force, whose report is due in February 1995, could set the foundation for developing clear and coordinated missions for the laboratory network. The success of the task force's efforts will depend, in large measure, on the extent to which DOE's leaders are now able—as they have been unable in the past—to achieve consensus among the laboratories, DOE, and the Congress on future missions for the national laboratories.

DOE's Management Inhibits Accomplishment of the Laboratories' Missions

Laboratory managers view DOE's day-to-day management as costly and unproductive in meeting the laboratories' missions. Tensions between laboratory and DOE executives may also be impeding progress toward reaching a shared vision of the laboratories' future. Laboratory managers have characterized DOE as a micromanager in many areas, especially in overseeing the laboratories' compliance with expanding administrative requirements.

Coping with the new requirements that have accompanied DOE's growing oversight responsibilities is, according to many of the laboratory managers we contacted, a major burden that not only increases the costs of research but also diverts attention from it. Although laboratory managers recognize the importance of meeting environmental, safety, and health goals, they expect DOE to set priorities for their administrative activities and to help them "balance" their responsibilities in the areas of research and administration.

DOE and other agencies conduct as many as 400 reviews annually at some laboratories, according to laboratory sources. One laboratory manager calculated that there was more than one oversight review a day in his program. Laboratory managers are concerned about the time required to prepare for oversight reviews and the loss of the best researchers' time during reviews. Another manager told GAO that he spends as much as 40 percent of his working time on oversight matters. Many laboratory managers expressed concern because they are held accountable for requirements that do not apply to research laboratories and do not differentiate between generic and specific problems.

Laboratory managers also worry that rising research costs—fueled by the growing costs of complying with administrative requirements—may be limiting the ability of the laboratories to compete for opportunities to conduct research sponsored by industry and other government agencies. This limitation could, in turn, diminish the ability of the laboratories to build partnerships with industry—the key to the success of their commercial technology mission.

DOE has begun to institute contract reform efforts. DOE believes that these efforts, especially the planned use of performance measures to guide and evaluate laboratory activities, will form a basis for a more productive management approach that better integrates the laboratories' mission goals with administrative requirements.

Recommendations

GAO recommends that the Secretary of Energy, on the basis of the management issues raised in this report, evaluate alternatives for managing the laboratories that more fully support the achievement of clear and coordinated missions, including strengthening the Department's Office of Laboratory Management.

Matter for Congressional Consideration

If DOE is unable to refocus the laboratories' missions and develop a management approach consistent with these new missions, the Congress may wish to consider alternatives to the present DOE-laboratory relationship. Such alternatives might include placing the laboratories under the control of different agencies or creating a separate structure for the sole purpose of developing a consensus on the laboratories' missions.

Agency Comments

DOE believes that the new strategic planning process that it put in place in 1994, together with the task force's upcoming report on the future of the laboratories, will address many of the issues raised in this report. The agency also believes that its new contract reform efforts, emphasizing the use of performance measures to evaluate the laboratories, will result in a more balanced management approach. DOE commented that these initiatives should be better reflected in GAO's report. GAO believes that the initiatives, when implemented, have the potential to substantially strengthen the agency's overall management capabilities. However, GAO also notes that past DOE reforms—including calls by previous task forces for clarifying the laboratories' missions and prior efforts at contract reform—have not always led to significant change. GAO has updated its report to reflect the agency's initiatives.

Contents

Executive Summary 2

Chapter 1 Introduction 10
- Laboratories Provide Unique Research and Development Capabilities 10
- Laboratories' Missions Have Evolved 11
- Objectives, Scope, and Methodology 12

Chapter 2 The Laboratories Need Their Missions Clarified 16
- Laboratories' Missions Are Unclear 16
- Clear and Coordinated Missions Would Help the Laboratories Address Cross-Cutting Issues 17
- Mission Uncertainty Is a Persistent Problem 19
- Debate on Developing Missions for the Laboratories Is Growing 21
- The Previous Congress Took Some Action on Laboratory Mission and Management Issues 21
- Further Efforts Are Under Way to Clarify the Laboratories' Missions 22

Chapter 3 A More Effective Management Approach Will Promote Mission Success 23
- DOE does Not Balance Research and Administrative Objectives 23
- DOE's Contractual Relationships Inhibit Change 27

Chapter 4 Experts See Future Missions as Extensions of Current Missions 29
- National Security Work Will Continue to Be Important 29
- Links Between Energy and Environmental Missions Are Needed 30
- Laboratories Can Contribute to Commercial Technology Mission 31

Chapter 5 Conclusions and Recommendations 34
- Recommendations 35
- Matter for Congressional Consideration 35
- Agency Comments and Our Evaluation 35

Appendixes

Appendix I: Profiles of DOE's National Laboratories 38
Appendix II: Laboratory Programs We Reviewed 39
Appendix III: Comments From the Department of Energy 41
Appendix IV: Major Contributors to This Report 45

Table

Table 1: GAO's Panel of Energy Experts 14

Abbreviations

DOE	Department of Energy
GAO	General Accounting Office
R&D	research and development

Introduction

The Department of Energy (DOE) is responsible for some of the nation's largest and most impressive scientific facilities. The agency's nine national multiprogram laboratories employ more than 50,000 people and have annual operating budgets that exceed $6 billion. DOE estimates that more than $100 billion has been invested in the laboratories over the past 20 years.[1] The laboratories' work covers many scientific areas—from high-energy physics to advanced computing—at facilities located throughout the nation. Although DOE owns the laboratories, it contracts with universities and private-sector organizations for their management and operation—a practice that has made the laboratories more attractive to scientists and engineers. The laboratory contractors and DOE form unique partnerships at each site, but the Department remains responsible for providing the laboratories with their missions and overall direction, as well as for giving them specific direction to meet both program and administrative goals.

Laboratories Provide Unique Research and Development Capabilities

The laboratories provide the nation with unique research and development (R&D) capabilities. Specifically, the laboratories

- enable researchers to work on complex, interdisciplinary problems that dominate current science and technology;
- permit the study of large-scale, high-risk problems that would be difficult for industry or universities to undertake; and
- provide unique research facilities for universities and industry to use while serving as focal points for research consortia.

DOE's laboratories have made wide-ranging contributions to defense and civilian technologies. For example, the laboratories have long produced and applied nuclear isotopes now used in thousands of diagnostic medical procedures daily. Safer cars and planes have evolved using computer crash simulation software developed at one laboratory. In 1994, the laboratories' technological achievements received 25 of the 100 prestigious "R&D 100 Awards" given annually by R&D Magazine for the year's most technologically significant products. Appendix I contains information on the staffing and funding, as well as the contractor and programmatic emphases, at each laboratory.

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[1] DOE is also responsible for several "single purpose" laboratories. These facilities concentrate in a particular program area or were created to pursue a single issue. Although these smaller laboratories are part of DOE's national laboratory network, we focused our attention on the nine multiprogram laboratories that dominate DOE's science and technology activities and budget resources.

Laboratories' Missions Have Evolved

When DOE was created in 1977, it inherited the national laboratories with a management structure that had evolved from the World War II "Manhattan Project," whose mission was to design and build the world's first atomic bombs. From this national security mission, the laboratories generated expertise that initially developed nuclear power as an energy source. The laboratories' missions broadened in 1967, when the Congress recognized their role in conducting environmental as well as public health and safety-related research and development. In 1971, the Congress again expanded the laboratories' role, permitting them to conduct nonnuclear energy research and development. During the 1980s, the Congress enacted laws to stimulate the transfer of technology from the laboratories to U.S. industry. DOE estimates that over the past 20 years, the nation has invested more than $100 billion in the laboratories.

The 1990s have brought the most dramatic changes affecting the multiprogram laboratories, including the following.

- The Soviet Union's collapse has reduced the nuclear arms race, raising questions about the need to maintain three separate weapons laboratories.
- The weapons laboratories, facing reduced funding in nuclear weapons research, have diversified their work in order to maintain their preeminent talent and facilities.
- Expectations are growing that all laboratories can and should help improve the nation's economic competitiveness by working with industry to develop commercial technologies.
- As the laboratories have aged, concerns have arisen about their ability to maintain their skills in weapons programs. Major investments will be needed to provide up-to-date facilities and attract younger scientists.
- In light of the general budget austerity facing the federal government, a stable funding environment is no longer guaranteed, and the laboratories will increasingly need to show useful results.

These and other forces have accelerated the laboratories' diversification from defense and nuclear research. For example, the nuclear weapons laboratories—Los Alamos, Sandia, and Lawrence Livermore—although created to design, develop, and test nuclear weapons, now devote less than half of their budgets to work on nuclear weapons. While these laboratories have been affected most dramatically by recent geopolitical changes, all DOE laboratories have been influenced by recent events and are redirecting their priorities.

The federal government owns the facilities and grounds of the laboratories and funds the work but has relied on contractors to manage and operate them. These contracts generally run for 5 years; however, some of the laboratories have been run by the same contractor for decades, even since their inception in the early 1940s. The laboratories' history of relative autonomy in daily research and operational management has led to concerns about their business practices as well as their attention to environmental, safety, and health issues.

Objectives, Scope, and Methodology

The objective of this report was to identify and examine the principal issues affecting the laboratories' missions and DOE's approach to laboratory management. The Congress has expressed considerable interest in these topics over the years, and our prior work at the laboratories, as well as other studies, has demonstrated that the laboratories' missions and management are key concerns. This work was carried out as part of our general management review of the Department of Energy.

Our work focused on DOE's nine multiprogram laboratories because of their size and importance as national science and technology resources. We selected laboratory staff to interview by asking each laboratory to identify five programs that best represented its current contributions and future capabilities. (App. II contains the list of programs the laboratories identified.) From these programs, we selected three for assessment. This approach allowed us to examine both the strengths as well as the weaknesses of the laboratories. When collecting information, we strove to identify and assess mission and management issues from the experience of the laboratory managers responsible for directing the programs we had selected. Our work also focused on each laboratory's technology transfer activities because of the increased national emphasis on using the laboratories to enhance U.S. technological competitiveness.

We collected information about the laboratories' missions and management from multiple sources with direct knowledge of these issues. At the laboratories, we interviewed managers who were responsible for the research programs we had chosen. We also held discussions with laboratory directors, senior officials responsible for technology transfer activities, and contractor representatives. At DOE, we interviewed program managers—Washington-based executives responsible for the research programs we had selected at the laboratories—and DOE field office managers, who oversee the Department's contractors at the laboratories.

To validate and refine our findings, we conducted two focus groups. The first group, which met with our staff in Chicago, consisted of one program manager from each of the nine laboratories. A second group, comprising program managers from DOE headquarters, met with our staff in Washington, D.C.

To obtain independent views about the laboratories' missions and management, we interviewed experts and industry representatives who were not associated with the laboratories. In addition, the National Academy of Public Administration assisted us in convening a panel of experts with backgrounds in (1) managing research in government and industry and (2) science and technology policy. Table 1 lists the panelists and their relevant professional experience.

Table 1: GAO's Panel of Energy Experts

Lewis Branscomb, Chair	Albert Pratt Public Service Professor, John F. Kennedy School of Government, Harvard University; Director, Science, Technology, and Public Policy Program. Formerly: Vice President and Chief Scientist, IBM; Director, National Bureau of Standards; Chairman, National Science Board.
Erich Bloch	Distinguished Fellow, Council on Competitiveness. Formerly: Director, National Science Foundation; Member, Committee on Computers in Automated Manufacturing; Vice President, Technical Personnel Development, IBM; Vice President and General Manager, IBM, East Fishkill, N.Y.
Sydney Drell	Deputy Director, Stanford Linear Accelerator. Formerly: Co-Director, Stanford University Center for International Security and Arms Control; Executive Head, Department of Theoretical Physics, Stanford University.
Harry Finger	Consultant. Formerly: President and CEO, U.S. Council for Energy Awareness; Vice President for Strategic Planning and Development Operations, and General Manager, Center for Energy Systems, General Electric Company; Assistant Secretary for Research and Technology, U.S. Department of Housing and Urban Development; Associate Administrator for Management and Director, Space Power and Nuclear Systems, National Aeronautics and Space Administration.
Donald Kerr	Executive Vice President, Science Applications International Corporation. Formerly: President, EG&G; Director, Los Alamos National Laboratory; Assistant Secretary for Energy Programs, Department of Defense.
Roland Schmitt	Consultant. Formerly: President, Rensselaer Polytechnic Institute; Senior Vice President, Science and Technology, General Electric; Senior Vice President, Corporate Research and Development, General Electric.
Robert White	President, National Academy of Engineering; Vice Chairman, National Research Council. Formerly: President, University Corporation for Atmospheric Research; Administrator, National Oceanic and Atmospheric Administration; Chief, U.S. Weather Bureau.

We also reviewed information and analyses from the laboratories, DOE, the Congress, industry, and independent experts, as well as legislative proposals and testimony, DOE documents, budget materials, and previous studies conducted by government and private organizations.

In analyzing information, we compared and contrasted views about laboratory mission and management issues. We found considerable agreement among all types of respondents on both topics. To give the reader concrete illustrations of how mission and management issues were viewed, we have used quotations from sources we interviewed throughout this report.

We obtained written comments on a draft of this report from DOE. The agency's comments and our evaluation are presented in appendix III and at the end of chapter 5.

We conducted our work from July 1992 through December 1994 in accordance with generally accepted government auditing standards.

Chapter 2

The Laboratories Need Their Missions Clarified

As the manager of the laboratories, DOE has not clarified how the laboratory system can and should meet national priorities. Although research programs set laboratory priorities to meet their own goals, DOE has not used the laboratories as a coordinated network of talent and facilities to meet missions that cut across programs. This approach not only inhibits the development of clear and coordinated missions for the multiprogram laboratories but also fails to draw upon the laboratories' expertise in multiple disciplines to solve complex, cross-cutting problems in science and technology.

These concerns are not new. In the past, many advisory groups emphasized the need to clarify and redefine the laboratories' missions. Although DOE recently developed a Strategic Plan and processes intended to integrate the Department's missions and programs in five major areas, questions remain about DOE's overall capacity to lead the national laboratories into new mission areas.

Laboratories' Missions Are Unclear

DOE's multiprogram laboratory system, as well as the individual laboratories, needs missions that are clear and coordinated with DOE's overall program goals in order to organize the system's efforts as effectively as possible. The clearer the mission, experts believe, the better the performance will be. In 1992, the Advisory Board to the former Secretary of Energy expressed the importance of clear missions as follows:

> Each national laboratory must have clearly defined, specific missions which support the over-arching missions of DOE to ensure the best technical and management performance and the greatest value to the nation.[2]

Only with clear missions, experts believe, can implementation strategies or "road maps" be developed that describe how each mission will be accomplished and guide each organization's day-to-day operations.

We found that the multiprogram laboratories—both individually and as a group—do not have either clearly defined missions or specific implementation strategies that bring together laboratory resources to focus on accomplishing departmental objectives and national goals. Although current mission statements for the laboratories describe their ability to conduct research in defense, energy, and environmental cleanup;

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[2] Secretary of Energy Advisory Board Task Force on the Department of Energy's National Laboratories, final report, July 1992

to transfer technology to industry; and to perform basic research, these activities have not been translated into overall missions for the laboratory system and specific missions for each laboratory. For example, one laboratory manager expressed concern to us that all laboratories have "generic" mission statements that tend to look remarkably similar. Laboratory managers frequently made comments to us such as "we don't really have a mission . . ." and "The laboratories must have a vision and goal toward which they can work." An expert we consulted expressed the current situation as follows:

> [We] have not seen crisp, specific mission statements from individual laboratories, nor specific mission statements that would cover all DOE's laboratories. Furthermore, DOE has not been able to describe the mission of the laboratories, nor are the laboratories' missions defined in any piece of legislation. . . .It is not possible to run a $6 billion organization without specific mission statements.

Laboratory managers we spoke with were also concerned that the Congress, DOE, and the laboratories do not share a "common vision" of the laboratories' missions. Such a common vision among the key "stakeholders" is crucial if the laboratories are to use their resources most effectively to support departmental programs and national goals—the main purpose of the laboratories' existence. Developing clear and more coordinated missions is particularly important, given the growing expectation that the laboratories will work together toward achieving national security, energy, environmental, and commercial technology goals. (Ch. 4 contains the opinions of our panel of experts on suitable missions for the national laboratories.)

The responsibility for developing the common vision rests with DOE. However, laboratory managers believed that DOE headquarters and operations offices have divergent views of the laboratories and their goals, and DOE has not been able to develop a consensus with the Congress on the future of the laboratories.

Clear and Coordinated Missions Would Help the Laboratories Address Cross-Cutting Issues

Without a coordinated set of laboratory missions, DOE is unable to address issues that require cooperation and coordination across its many mission areas. This not only inhibits cooperation among research programs but also keeps DOE from using its laboratories to achieve departmental missions.

Laboratory and DOE managers are concerned that DOE has not built on its individual programs to encourage valuable cross-program and cross-laboratory interactions, which are essential to meeting both current and future missions. Both laboratory and DOE program managers describe DOE's management as "fractured" and not particularly adept at combining the expertise of various program areas to tackle cross-disciplinary problems. Laboratory managers cited difficulties DOE has in establishing bridges between its basic science programs and applied science groups. Developing clear and coordinated missions—and strategies to implement them—would provide the necessary bridges between and among the laboratories on cross-cutting projects, according to many laboratory and independent experts.

Many laboratory managers believe that DOE and its laboratories lack effective coordinating mechanisms—among the most serious challenges facing the Department as an organization. One manager described as a "horrible problem" the limited emphasis on cross-program coordination.

To illustrate the difficulties in combining expertise from different programs to achieve core missions, several laboratory managers cited the fragmented research on preventing the proliferation of nuclear weapons. Although solutions to proliferation problems require expertise in identifying the effects of weapons, the nonproliferation and weapons missions are carried out in different laboratories and are managed by different assistant secretaries. Laboratory managers also cited weak links among the energy conservation, fossil fuel, and nuclear energy research programs as having limited DOE's progress in commercializing energy technologies.

When DOE and the laboratories have successfully combined their multidisciplinary resources, impressive results have occurred. For example, laboratory managers attributed the rapid progress toward a coordinated understanding of global environmental change in DOE's Global Studies Program to the use of nine laboratories' diverse capabilities. According to another laboratory manager, cross-laboratory cooperation in the fusion energy program is leading to a long-range strategy to guide research. These examples illustrate the potential for greater collaboration on technical issues that require multidisciplinary talent.

Mission Uncertainty Is a Persistent Problem

Concerns about the need to update and clarify the laboratories' missions are long-standing. Past studies and reviews of the laboratories have all reached the same conclusion, as the following examples show:

- In 1983, the White House Science Council Federal Laboratory Review Panel issued a report (commonly known as the Packard Report) addressing all federal laboratories.[3] The report found that while some of the laboratories, particularly DOE's, had clearly defined missions for parts of their work, most activities were fragmented and unrelated to the laboratories' main responsibilities. This report recommended that all parent agencies review and redefine the missions of their laboratories.
- In 1992, a DOE Secretary of Energy Advisory Board found that the broad missions the laboratories were addressing, coupled with rapidly changing world events, ". . . ha[d] caused a loss of coherence and focus at the laboratories, thereby reducing their overall effectiveness in responding to their traditional missions as well as new national initiatives. . . ." The Board identified the most important cause of the stress between DOE and its laboratories as ". . . the lack of a common vision as to the missions of the laboratories. . . ."[4]
- A 1993 report of an internal DOE task force on laboratory missions reported that the missions "must be updated to support DOE's new directions and to respond to new national imperatives. . . ."[5]

None of these past studies and reviews has resulted in overall consensus about the future missions of the multiprogram laboratory system, raising questions about DOE's capacity to provide a vision for this system. A 1982 DOE Energy Research Advisory Board task force provided some insights into this question.[6] The Advisory Board acknowledged the impressive nature of the research and development conducted throughout the system but noted that certain weaknesses prevented the laboratories from achieving their full potential. The Advisory Board found, for example, that structural problems and fragmented programs required the laboratories to interact with DOE on an excessive number of levels. The Advisory Board recommended that DOE designate a high-level official to focus solely on the laboratories. DOE did not follow the Advisory Board's recommendations. In early 1993, however, DOE created an Office of Laboratory Management whose purpose was, in part, to coordinate the interests of the various DOE program offices that interact with the laboratories on a program-by-program basis. However, according to DOE officials, the plan was not implemented, and the existing office does not coordinate laboratory activities for all program offices and does not report directly to the Secretary.

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[3] Report of the White House Science Council, Federal Laboratory Review Panel, Office of Science and Technology Policy, May 15, 1983.

[4] Secretary of Energy Advisory Board, Final Report, 1992.

[5] Changes and Challenges at the Department of Energy Laboratories, Final Draft Report of the Missions of the Laboratories Priority Team, 1993.

[6] The Department of Energy Multiprogram Laboratories, A report of the Energy Research Advisory Board to the Department of Energy, Sept. 1982.

We called attention to the limitations of DOE's program-by-program approach to directing its laboratories as early as 1978, after reviewing the laboratories' contributions to nonnuclear energy, a critical policy issue at that time.[7] The laboratories' activities in this area were limited by several factors. First, DOE's organizational alignment created obstacles; specifically, the laboratories reported to three different senior officials. This arrangement focused the efforts of the laboratories on particular programs and eroded their abilities to pursue research on topics cutting across several areas, such as nonnuclear energy. Second, the roles of the laboratories were determined in a piecemeal way so that each laboratory was given small, fragmented responsibilities. We recommended that DOE align the laboratories under a separate high-level office that was not responsible for specific programs.

In the absence of an overall mission strategy for the laboratories, individual research program goals are emphasized, sometimes at the expense of broader DOE and laboratory missions. One laboratory manager noted:

> Most of what we do is determined from the bottom-up . . . in other words, the program level in DOE—and DOE program managers don't [care] about what the [laboratory's] missions are. They want to know where the talent is, and they want to know where the capability is, and that's where they put their work.

A DOE operations office manager said that the Department's program-oriented approach toward the laboratories fails to recognize DOE's "corporate" responsibility for them. Another manager cited the need for DOE to develop a strategic approach to the laboratories. Laboratory managers pointed out that DOE's approach to the laboratories through individual research programs has not effectively linked the laboratory system's collective resources to DOE's missions. A laboratory manager described DOE as increasingly focused on individual programs; its management is concentrated at the assistant secretary level, even though many projects do not fall within any one assistant secretary's program responsibilities.

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[7] The Multiprogram Laboratories: A National Resource for Nonnuclear Energy Research, Development and Demonstration (EMD-78-62, Mar. 22, 1978).

Debate on Developing Missions for the Laboratories Is Growing

How best to develop missions for the laboratories—and how best to manage them—is the subject of growing debate in the scientific community and was discussed by our panel of experts. For example, proposals suggested or debated during our review included the following.

- Convert some laboratories, particularly those working closely with the private sector, into independent entities.
- Transfer the responsibility for one or more laboratories to another agency, whose responsibilities and mission are closely aligned with a particular DOE laboratory.
- Create a "lead lab" arrangement, under which one laboratory is given a leadership role in a mission or technology area and other laboratories are selected to work in that area.
- Consolidate the responsibility for research, development, and testing on nuclear weapons within a single laboratory.

While we have not analyzed these alternatives, each has advantages and disadvantages and needs to be evaluated in light of the laboratories' capabilities for designing nuclear weapons and pursuing other missions of national and strategic importance. Furthermore, the government may still need facilities dedicated to national and defense missions, a factor that would heavily influence any future organizational decisions. Important budgetary considerations also accompany each alternative.

An expert panelist advised caution in restructuring the laboratories, expressing concern that decades of national investment in these facilities have produced important assets that, if dispersed, could take many years and billions of dollars to reassemble.

The Previous Congress Took Some Action on Laboratory Mission and Management Issues

The previous Congress was also active in the debate on the laboratories' missions. For example, a House bill introduced in 1993 defined future missions for DOE's laboratories and suggested methods for measuring progress toward goals, along with incentives for improving the overall quality of research at the laboratories. This proposed legislation also sought to require more rigorous evaluation of the laboratories, articulated several missions for them (such as advancing nuclear science and technology for national security purposes), and advocated that they work with private industry to develop environmental technology and technology transfer activities. A bill passed by the Senate in 1993 contained similar provisions and was designed to sharpen the laboratories' focus on technology transfer and cooperative research agreements. This bill would have required the laboratories to allocate 20 percent of their budgets to partnerships with industry and academia.

Further Efforts Are Under Way to Clarify the Laboratories' Missions

Recognizing the important role that the multiprogram laboratories should play in accomplishing departmental goals and national priorities, DOE is making another attempt to define the laboratories' missions. In February 1994, the Secretary commissioned an independent task force to address the appropriate roles of DOE's laboratories. Chaired by the former chief executive officer of Motorola Corporation, this task force—the Secretary of Energy Advisory Board Task Force on Alternative Futures for the Department of Energy National Laboratories—is charged with, among other things, examining "alternative scenarios for future utilization of these laboratories for meeting national missions." The task force's charter encompasses examining the future roles and responsibilities of the national laboratories, including questions about their accountability and consolidation. The task force's report to the Secretary is expected by February 1995.

DOE has also initiated a strategic planning process that it believes will form a framework for coordinating the laboratories' missions with the agency's goals and objectives.[8] DOE's Strategic Plan will focus the agency's efforts on five main areas: preserving national security, conserving energy resources, promoting environmental protection, applying science and technology to national needs, and encouraging industrial competitiveness. Strategic plans have also been developed for each of these areas. In addition, DOE has begun a major reorganization effort, which is designed to follow the structure of its new Strategic Plan. Reorienting existing programs and the laboratories to best address these areas remains the Department's challenge.

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[8] Strategic Plan: Fueling a Competitive Economy. U.S. Department of Energy, DOE/0108, Apr. 1994.

A More Effective Management Approach Will Promote Mission Success

Laboratory managers see DOE's management of the multiprogram laboratories as costly and inefficient, creating tensions that impede the development of clear and coordinated missions for the laboratories and action steps that lead toward achieving these missions. According to laboratory managers, DOE micromanages the laboratories, particularly in overseeing their compliance with growing numbers of administrative requirements. Laboratory managers fault DOE for failing to set priorities or provide guidance about how to satisfy both research goals and administrative requirements.

Experts we consulted, as well as many laboratory and DOE managers, expressed concern that without a more effective management relationship between DOE and the laboratories, rising research costs may price the laboratories out of collaborative research with industry—a new mission area in which the laboratories are expected to make major contributions.

DOE does Not Balance Research and Administrative Objectives

In addition to meeting their research and technology objectives, laboratory managers are responsible for satisfying a wide variety of administrative requirements in areas such as procurement; travel; human resources; and environment, safety, and health. Prompted by criticism of its business practices and past inattention to environment, safety, and health issues, DOE has greatly increased its oversight of the laboratories during recent years.

Coping with the new requirements that have accompanied DOE's expanded oversight is, according to a consensus of laboratory managers, a major burden that not only increases research costs but also diverts attention from basic research. Although laboratory managers recognize the importance of meeting administrative goals—particularly in the area of environment, safety, and health—they want DOE to set priorities for their administrative activities and help them balance research and administration.

Administrative Requirements Have Proliferated

Administrative requirements increased under the former Secretary of Energy, largely in response to the well-publicized call for greater attention to the environment, safety, and health throughout the nuclear weapons complex. Thus, over 70 percent of the requirements listed in DOE's 1993 Directives Checklist are new or have been revised since 1989. A DOE operations office manager estimated that DOE has about 8,400 environment, safety, and health requirements. Directives define required actions to meet certain objectives; these actions range from preparing reports to conducting inspections. Both laboratory and DOE operations office managers who administer directives told us they were "numb" from the proliferation of requirements. According to a consensus of both laboratory and DOE managers, the laboratories have been overwhelmed, not only by the volume of new requirements but also by their detail and by inconsistent guidance for implementing them.

Closely related to the proliferation of administrative requirements has been the equally aggressive expansion of oversight activity. Oversight—or the assessment of how well managers handle the programs and requirements for which they are accountable—is critical to the operation of federal programs and is a key management responsibility. Despite its vital role, laboratory managers, the experts on our panel, and DOE managers agreed that sharply increased oversight in recent years has not been an effective management approach for DOE.

DOE and other agencies conduct as many as 400 reviews annually at each laboratory. One laboratory manager calculated that his program was reviewed more than once a day in 1992. Laboratory managers deplored the enormous amount of time required to prepare for oversight reviews, adding that the impact of losing the best researchers' time during reviews is difficult to quantify. Many scientists have become discouraged by administrative chores. One manager complained that administrative oversight consumed as much as 40 percent of his working time, and many managers questioned whether DOE's expanded oversight has produced benefits commensurate with its costs.

Oversight reviews of the laboratories have been particularly burdensome because they have been inconsistent. Laboratory managers deal with three large bureaucracies—DOE headquarters, DOE operations offices, and contractors. Each interprets DOE's oversight requirements, which, in turn, sometimes conflict. One manager expressed the problem this way:

> There are myriad rules and regulations that require a substantial amount of interpretation. In the absence of a single environment, safety, and health oversight organization, every laboratory will have a different level of compliance because each field office has a different interpretation of environment, safety, and health rules.

Requirements Do Not Reflect Laboratory Conditions

Both laboratory and DOE managers say they are held accountable for requirements that do not reflect problems in research laboratories or do not differentiate between general and isolated problems. According to the managers, many environment, safety, and health requirements are appropriate for problems and operations at weapons production facilities, not at laboratories. A laboratory manager explained the effect of inappropriate requirements on research:

> We end up treating very simple chemical experiments as if people were working with commercial nuclear reactors. . . our costs have gone right through the roof and our staff's ability to turn out the volume has decreased dramatically.

Many laboratory managers also said that they had been held accountable for problems that occurred at another location—experiencing what a DOE operations office manager described as "battalion punishment." For example, frozen pipes at one facility resulted in a directive to all laboratories, including those in warm climates. A laboratory manager explained:

> If lab A screws up—say environmental health or quality assurance—[DOE] headquarters decides that everybody's guilty and we're then overrun with sieges and inspections. Instead of going back to that laboratory and trying to understand why that went bad, we're all condemned by the same punishment.

Meeting all of these responsibilities presents a significant challenge, especially as budgets decline. Yet laboratory managers maintained that DOE has provided little guidance or assistance in setting priorities to help them balance their responsibilities.

Part of the problem, according to many laboratory managers, stems from the existence within DOE of parallel research and administrative reporting and oversight systems. Decisions are made about requirements in one area without assessing their impact on the other, and research and administrative compliance programs each have different reward structures. A laboratory manager also noted that no one takes responsibility for resolving conflicts between the two systems. As one senior laboratory manager explained to us:

> There is a split in DOE between the people who run programs and those who issue regulations. . . .Funds tend to come in at the bottom to scientists, while regulations tend to come in at the top of the organization . . . often the scientists do not understand the rationale for regulations.

Costs Present a Major Issue

Managers at the laboratories, in DOE programs, and at DOE operations offices were troubled by the costs associated with achieving the

Department's administrative goals. Although little information or analysis has been completed on this issue, DOE's administrative compliance approach has had two results, according to both DOE and laboratory managers. First, it has been costly. Second, it has raised research costs and reduced the laboratories' ability to compete with universities for research sponsored by industry and other government agencies.

For example, a laboratory manager told us that operating a reactor costs significantly more under DOE's safety regulations than under the Nuclear Regulatory Commission's regulations for non-DOE reactors. A DOE operations office manager added that it would cost billions more than is currently spent to be in full compliance with all rules and regulations at several laboratories, even though these laboratories have lower-priority problems. Laboratory and DOE managers agreed that DOE has not provided the funding required to achieve compliance, particularly with environment, safety, and health regulations. A DOE operations office manager noted that no additional funds had been received at one laboratory where expenditures of more than $1 billion would be required to correct environment, safety, and health problems.

Managers also expressed considerable concern that DOE's administrative compliance approach has raised research costs, limiting the laboratories' ability to compete for research funded by industry and other government agencies. For example, one research organization reported that renewing its contract with a laboratory would cost up to 3 times more than its previous contract. Laboratory and DOE managers and experts agreed that universities—the laboratories' main competitors for research—need not meet many of the requirements that DOE imposes. An expert expressed concern that increases in the costs of research could adversely affect the laboratories' commercial technology mission, pointing out that

> There is a trend toward imposing the full range of government procurement requirements on the laboratories, and this could kill government-industry cooperation. . . .For industry to find cooperative research agreements with laboratories a viable option, laboratory costs must be fully competitive.

Laboratory and DOE managers and an expert on our panel believe that administrative programs should be cost-effective and have priorities for compliance so that resources can be concentrated on the most significant risks. However, DOE has not systematically set priorities for its administrative requirements, and cost-benefit analyses have not been used to assess risks.

DOE Has Begun to Address Oversight Issues

DOE has begun to streamline the directives system and correct other oversight problems. Also, the Department is now seeking to avoid duplicative or unnecessary oversight reviews and is more careful about overloading laboratories with such reviews. In addition, DOE has begun to implement "total quality management" and is developing performance measures to guide its evaluation of the laboratories' management. DOE believes that these efforts should help both it and the laboratories balance their research and administrative goals more effectively in the future.

DOE's Contractual Relationships Inhibit Change

DOE's "management and operating" contracts with the academic institutions that operate most of the multiprogram laboratories pose a further stumbling block both to a more favorable relationship between the Department and the laboratories and to a reduction in DOE's oversight. Under these contracts, a contractor assumes responsibility for managing and operating a facility but incurs only limited liability. DOE pays virtually all of the contractor's costs except those resulting from willful misconduct or bad faith by top management or those designated as unallowable. Furthermore, under its contracts with the laboratory contractors, most of which are nonprofit or academic institutions, DOE has limited financial incentives for influencing the contractor's actions: It cannot adjust the fee that it pays to these contractors because it has historically negotiated a fixed fee with them that is not tied to their performance. In contrast, DOE pays its for-profit contractors a fee, called an "award fee," that is based on its assessment of their performance. The tensions created by the arrangements between DOE and its nonprofit contractors have raised questions about whether DOE's current contracting approach is effective for managing the laboratories. DOE and various oversight groups, including GAO, have expressed concerns about the laboratories' past business practices and have called for changes in contracts that better reflect the needs of the laboratories and the requirements of DOE.

DOE is changing its relationship with contractors. Under its contract reform initiative, contractors will be evaluated on the basis of performance measures—a process that DOE believes will better enable it to hold contractors accountable for results.[9] In addition, according to DOE staff, the use of performance measures will lead to a more rational, risk-based approach toward compliance with the increased number of requirements placed on the laboratories in recent years.

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[9] We have reported on performance-based contracting in Department of Energy: Challenges to Implementing Contract Reform (GAO/RCED-94-150, Mar. 21, 1994).

We support DOE's contract reform efforts and believe that, once implemented, they offer opportunities for substantially improving the way the agency does business with its contractors, including its laboratory contractors. We are concerned, however, that the scope of DOE's current contract reform may not address all the major management problems that characterize the agency's relationship with the laboratories. For example, it is uncertain how contract reform will resolve the proliferation of laboratory oversight activities, which poses a major problem for laboratory managers. Furthermore, it could take many years for contract reform to take effect, given the multiyear time frame for existing contracts.

175

Experts See Future Missions as Extensions of Current Missions

Our panel of experts and other experts believe that, with proper mission focus and management direction, the multiprogram laboratories can make vital contributions in many areas important to DOE and the nation. According to the panel, the highest-priority missions for the laboratories are national defense, energy, the environment, and commercial technology. While the laboratories have already made contributions in these areas—such as effective weapons systems, energy conservation programs, environmental cleanup techniques, and commercialized technologies—our panel concluded that clarifying and, in some cases, redefining the current missions for the laboratory system as a whole would enhance the value of the laboratories.

National Security Work Will Continue to Be Important

Our panel of experts agreed that the laboratories' national security work will continue to be important. Until the Department of Defense has decided whether to support defense work at the laboratories and DOE's missions are clear, the defense roles of Los Alamos, Sandia, and Lawrence Livermore are unclear. However, several panelists anticipated a defense mission with new and continuing objectives that would use these three laboratories' nuclear weapons competence and other laboratories' experience.

In nuclear weapons technologies, several of the experts on our panel predicted that the laboratories' missions would continue to shift from designing weapons to overseeing and dismantling the nuclear stockpile, verifying international nuclear treaties, and conducting research on nonproliferation. Because the Department is substantially responsible for overseeing the weapons stockpile, it will require the laboratories' unique competencies. Ensuring that stockpiled nuclear weapons are reliable and safe is a major responsibility that will persist as long as the nation needs to sustain a nuclear stockpile, a panelist pointed out.

The defense mission also makes the laboratories responsible for overseeing the dismantling of nuclear weapons in accordance with the nation's international treaty obligations—a task that will take decades to complete at the current pace, a laboratory director pointed out. According to a laboratory director, the United States and Russia each estimate that they can dismantle only 2,000 weapons a year. The current U.S. stockpile contains many thousands of weapons.

The proliferation of nuclear technology and materials will be an increasingly important national concern. As a DOE manager noted, a growing number of nations are now able to make nuclear weapons, and more have the political will to develop them. Our panel of experts concurred that the laboratories have unique knowledge to address these issues. For example, the laboratories already have experience in detecting clandestine nuclear weapons programs, locating terrorists' weapons, responding to nuclear weapons emergencies, and identifying the origin of nuclear materials and weapons.

Links Between Energy and Environmental Missions Are Needed

Energy and the environment are areas in which the laboratories have already made useful contributions. However, our panel of experts suggested that the laboratories could enhance their contributions by linking their missions in these areas to focus on energy-related environmental problems—an increasingly important issue, according to a DOE secretarial advisory board. This linkage would demonstrate the effect of research in one area on work in another, an important consideration because energy development and use underlie most of the nation's serious environmental problems. For example, the use of electric vehicles would reduce emissions of hydrocarbons but create problems in disposing of batteries. Similarly, the production of commercial nuclear power reduces some air quality problems but creates a need for technologies to dispose of radioactive wastes. As a panelist pointed out, linking energy and environmental research would draw upon the laboratories' ability to address cross-disciplinary problems. This linkage would benefit research in both areas and enhance the ability of DOE and the laboratories to set research and policy priorities.

Our panel of experts agreed that the laboratories have an important energy research mission. One panelist described it as perhaps their principal mission because developing energy sources and efficient uses of energy is vital to the nation's economy. However, another panelist maintained that although the laboratories' energy mission is broad, it has become fuzzy. Panelists also noted that despite substantial investment, the laboratories' energy research has been disappointing. One panelist noted that the nation has been unable to decide on an energy policy to guide the laboratories' work. DOE has produced several different national energy strategies over the years, each with different priorities, making long-term planning for the laboratories difficult. Despite these conditions, however, panelists agreed that a redirected energy mission would serve the United States very well and provide opportunities for large-scale interactions between industry and government. One panelist urged DOE to consider the laboratories' experience, encourage closer laboratory-industry interactions to define priorities, and focus on path-breaking, high-risk, cross-industry research with the potential for major payback in 10 to 20 years.

The laboratories' environmental mission has been more implicit than explicit, according to one panelist. Although the laboratories have been developing environmental technologies, the scope of their environmental mission has not been clear. However, several of the panelists envisioned that the laboratories could make unique contributions, particularly in environmental technology—an area where other federal agencies have limited experience—and in nuclear waste disposal. Significant contributions may also stem from the laboratories' ability to model environmental impacts with their advanced computing facilities. Several panelists believed that greater coordination between DOE and the Environmental Protection Agency would be needed to maximize the value of this type of laboratory work.

A laboratory director emphasized to us that through their basic research competencies the laboratories can make a major contribution to solving environmental challenges, but their strengths have been underutilized. According to the director, "Waste remediation cannot continue on its present course without 'bankrupting the country' because it is being done without a knowledge base."

As a laboratory manager noted, developing a basic understanding of underlying problems before developing waste cleanup technologies is important. If the basic science is not understood, environmental remediation problems may elude solution, just as efforts to cure cancer during the 1970s were unsuccessful because not enough was then known about basic cancer virology.

Laboratories Can Contribute to Commercial Technology Mission

Our panel of experts agreed that a commercial technology mission for the laboratories is legitimate and important. However, several panelists and other experts we consulted maintained that this mission should be broadly conceived—that is, it should emphasize research and development that can benefit all U.S. industries and should be integrated with other laboratory missions rather than become a central mission.

According to panelists, the principal reason for enlisting the laboratories in improving the nation's global competitive position is that they are building the intellectual foundation that allows the nation's economy to prosper. A laboratory director pointed out that U.S. industry has sometimes been at a disadvantage because public-private research is better coordinated in other countries.

There was considerable agreement among both the experts on our panel and other experts we consulted about the need to change the laboratories' current focus on transferring existing technology to industry on a project-by-project basis. Industry, expert, and government sources concurred that the technology mission would be more productive if it supported

- nonproprietary research that could help all industries compete;
- technology research as an integral part of the national security, energy, and environmental missions;
- long-term cooperative research relationships between the laboratories and industry; and
- training in science for future progress in technology.

According to a panelist, nonproprietary research that can benefit all industries is important but has been underfunded and conducted without focus. The panelist emphasized that the government can usefully and appropriately support research that underpins a broad array of specific technology applications in many different industries, stopping short of supporting proprietary technology that companies themselves should fund. For example, experts noted that laboratory research to improve the U.S. transportation system could enhance U.S. manufacturers' ability to compete. Similarly, a panelist noted that laboratory work on advanced computer-aided design tools could improve productivity throughout the U.S. manufacturing sector.

Although a commercial technology mission is important, laboratory managers, industry representatives, and experts cautioned that developing technology should not become the laboratories' primary mission or reason for existence. The officials described the challenge as defining a broad technology mission that supports long-term relationships between the laboratories and industry while sustaining the laboratories' other missions and abilities. For example, the laboratories develop technology through other missions that have technological needs of their own. Sustaining the laboratories' basic research is also important. Laboratory managers observed that a balance is needed between basic and applied research in order to avoid "eating the seed corn" that leads to new technologies. In addition, not all programs—such as high-energy physics—lend themselves to cooperation with industry. A laboratory manager said that with only a technology transfer mission, the laboratories would be out of business in 5 years.

Several of the experts on our panel encouraged laboratories and industry to develop long-term cooperative research relationships that can allow each party to better understand the other's needs and increase the potential for results.

Panelists and other experts we consulted agreed that training in science and mathematics is essential to the nation's future competitiveness in high-technology products and services and that helping train students is important to a commercial technology mission. Several panelists also urged that, to enhance industry's ability to produce marketable innovations, the laboratories expand their training programs to include mid-career technical retraining for industry personnel.

Implementing a Commercial Technology Mission Poses Special Problems

Working with industry on a commercial technology mission at the laboratories presents special challenges for DOE and laboratory management. Although some laboratories have considerable experience in working with industry, broad-scale cooperation represents a new venture for the laboratories. DOE has begun to work with the laboratories and industry to develop a strategic plan for technology partnerships. However, successful implementation of this new mission requires clearly defined roles for the laboratories and DOE, realistic expectations about the laboratories' potential to improve U.S. competitiveness, encouragement to experiment, well-defined mission objectives, and closer links between the laboratories and industry to ensure that the laboratories' work reflects the market's needs.

Conclusions and Recommendations

U.S. taxpayers have a significant investment in the national laboratory network. DOE has a major responsibility to ensure that work at the laboratories is properly focused and intelligently managed so that the laboratories can make maximum contributions to national priorities. Achieving these goals requires two efforts: First, senior leadership needs to develop clear missions and implementation strategies that treat the laboratories as a coordinated set of facilities; second, DOE needs to adopt a management approach that supports the laboratories' achievement of their research missions and administrative responsibilities.

DOE has not been able to develop a consensus among laboratory and government leaders on appropriate missions for the national laboratories, even though past studies and special task forces have called for such action. Furthermore, the Department's management approach impedes progress toward current goals, raising questions about DOE's overall capacity to achieve these important objectives.

The results from the Secretary's Advisory Board Task Force on Alternative Futures for the National Laboratories could set the foundation for developing clear and coordinated missions for the national laboratory network. The success of these results can best be measured by the extent to which they help shape a consensus among key stakeholders: the Congress, DOE, and the laboratories. Such a consensus on the future missions for the national laboratories has not resulted from past advisory board recommendations.

DOE's ongoing contract reform efforts—especially the planned use of performance measures to guide and evaluate the laboratories' activities—could form a solid basis for an improved management approach that supports the laboratories' mission goals and administrative requirements. These goals will be difficult to achieve, however, given current management practices and the contracting constraints under which both DOE and the laboratories operate. For these and other reasons, experts are beginning to question where alternative forms of laboratory management should be considered.

As public debate on the future of the laboratories grows—for example, the Congress, in a previous session, proposed legislation setting specific missions for the laboratories—DOE's leaders cannot afford to delay efforts to define clear and coordinated missions and to implement a management approach that supports these missions.

107

Indeed, if the laboratories do not begin to function more as a system, it may be necessary to consider alternatives to the present DOE-laboratory relationship. Above all, strong DOE leadership is needed to establish a shared vision about the laboratories' expected contributions. DOE leadership is especially important to implementing the new commercial technology mission. There are encouraging signs that DOE is committed to involving industry in this implementation and improving its access to the laboratories.

Recommendations

We recommend that the Secretary of Energy evaluate alternatives for managing the laboratories that more fully support clear missions, achieve results by linking the laboratories' activities to DOE's missions, and maximize the laboratories' resources. Such a strategy could start by addressing the many management issues raised in this report and should be consistent with DOE's major efforts to reform contract management. The strategy must also support goals for DOE and the laboratories to comply with environment, safety, and health initiatives. To help achieve this goal, the Secretary should strengthen the Office of Laboratory Management by providing it with sufficient resources and authority to facilitate cooperation with the laboratories and resolution of management issues across all DOE program areas.

Matter for Congressional Consideration

If DOE is unable to refocus the laboratories' missions and develop a management approach consistent with these new missions, the Congress may wish to consider alternatives to the present DOE-laboratory relationship. Such alternatives might include placing the laboratories under the control of different agencies or creating a separate structure for the sole purpose of developing a consensus on the laboratories' missions.

Agency Comments and Our Evaluation

DOE officials believe that they are taking a number of actions that address our concern about DOE's leadership in providing mission focus for the national laboratories. Specifically, in its letter to GAO, and in discussions with us, DOE cited its new strategic planning process, which resulted in a Strategic Plan that, in turn, is supported by five separate plans covering each of the Department's core "business lines." DOE anticipates that this process, together with the upcoming report expected from the Secretary's Energy Advisory Board Task Force on Alternative Futures for the Laboratories, will provide the means through which the Department will exercise new leadership for its national laboratories.

GAO is encouraged by these initiatives. Coupled with the Department's contract reform efforts, they should, once fully in place, strengthen DOE's ability to improve its own management as well as provide a foundation for refocusing the laboratories' missions. The outcome of these efforts bears close monitoring by the Congress. Our optimism is tempered, however, by DOE's having reorganized before and having had planning efforts in the past. Furthermore, DOE has not used the recommendations of past advisory groups to refocus the laboratories or improve its management of them.

DOE expressed concern that our report would force "tight mission-driven parameters" for the laboratories, which would inhibit the laboratories' flexibility in conducting fundamental research. We are not suggesting that DOE narrow the laboratories' missions. Instead, we believe that DOE should clarify mission-focused research and development within its laboratories and coordinate these activities among them. The need to clarify and focus the laboratories' missions reflected a widespread consensus among the laboratory and DOE managers, as well as among the experts, with whom we spoke.

Appendix I

Profiles of DOE's National Laboratories

Dollars in millions

Laboratory/location	Actual budget (FY 1994)	Staff (FY 1994)	Program emphases	Contractor
Argonne/ Argonne, Illinois	$614	5,083	Basic energy sciences, nuclear engineering, environmental science and technology	University of Chicago
Brookhaven/ Upton, New York	$408	3,417	High-energy and nuclear physics, basic energy sciences	Associated Universities, Inc.
Idaho Engineering/ Idaho Falls, Idaho	$911	7,823	Reactors, environmental restoration, waste management	Lockheed Idaho Technologies Company
Lawrence Berkeley/ Berkeley, California	$282	3,129	Basic energy sciences, nuclear and high-energy physics, biological and environmental research	University of California
Lawrence Livermore/ Livermore, California	$965	7,321	Defense, energy, high-performance computing, lasers	University of California
Los Alamos/ Los Alamos, New Mexico	$1,075	7,024	Defense, applied research in nuclear deterrence and security	University of California
Oak Ridge/ Oak Ridge, Tennessee	$577	4,714	Basic energy sciences, conservation, renewable energy	Martin Marietta Energy Systems
Pacific Northwest/ Richland, Washington	$532	4,383	Environmental restoration, waste management, energy research	Battelle Memorial Institute
Sandia/ Albuquerque, New Mexico	$1,304	8,494	Defense, nuclear weapons and safety	Martin Marietta Corporation

Note: The information for this appendix was supplied by DOE operations offices and the national laboratories.

Laboratory Programs We Reviewed

Laboratory	Programs submitted by laboratory
Argonne	•Integral Fast Reactor[a] •Operation and Research at the Tandem Linac Accelerator System •Electrochemical Dezincing of Scrap Galvanized Steel •Atmospheric Radiation Measurement[a] •Advanced Photon Source[a]
Brookhaven	•High-Energy Physics[a] •National Synchrotron Light Source[a] •Relativistic Heavy Ion Physics •Structural Biology[a] •High Flux Beam Reactor
Idaho National Engineering Laboratory	•Buried Waste Integrated Demonstration Program[a] •ICPP Spent Fuel and Waste Management Technology Development[a] •Power Reactors[a] •Biotechnology •Space Nuclear Power and Propulsion
Lawrence Berkeley	•Advanced Light Source[a] •Advanced Battery Consortium[a] •Solenoidal Tracker at RHIC •Human Genome Center •Center for Advanced Materials[a]
Lawrence Livermore	•Nuclear Weapons Research, Development, and Testing[a] •Nonproliferation, Arms Control, and International Security[a] •Fusion[a] •AVLIS •Environmental Technologies
Los Alamos	•Waste Treatment •Above Ground Experiments[a] •Human Genome Center[a] •High Temperature Superconductors •High Performance Computing and Communications[a]
Oak Ridge	•Basic Energy Sciences[a] •Conservation and Renewables[a] •Fusion[a] •Biology and Environmental Research •Advanced Neutron Source
Pacific Northwest	•Environmental Restoration and Waste Management[a] •National Security and Defense Technology[a] •Energy •Scientific Research[a] •Technology Transfer

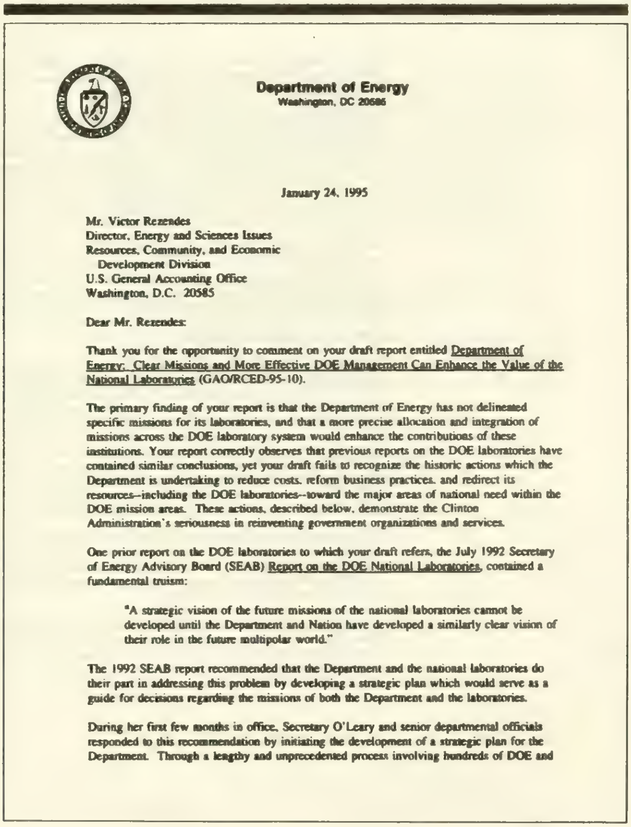
(continued)

Laboratory	Programs submitted by laboratory
Sandia	•Complex 21 •Nonproliferation and Verification[a] •Microelectronics and Photonics Center[a] •Environmental Programs[a] •Combustion Research

[a] We discussed these programs with managers and staff. We selected these programs from those that each laboratory identified as best representing its future direction.

Comments From the Department of Energy

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



Department of Energy
Washington, DC 20585

January 24, 1995

Mr. Victor Rezendes
Director, Energy and Sciences Issues
Resources, Community, and Economic
Development Division
U.S. General Accounting Office
Washington, D.C. 20585

Dear Mr. Rezendes:

See comment 1.

Thank you for the opportunity to comment on your draft report entitled Department of Energy: Clear Missions and More Effective DOE Management Can Enhance the Value of the National Laboratories (GAO/RCED-95-10).

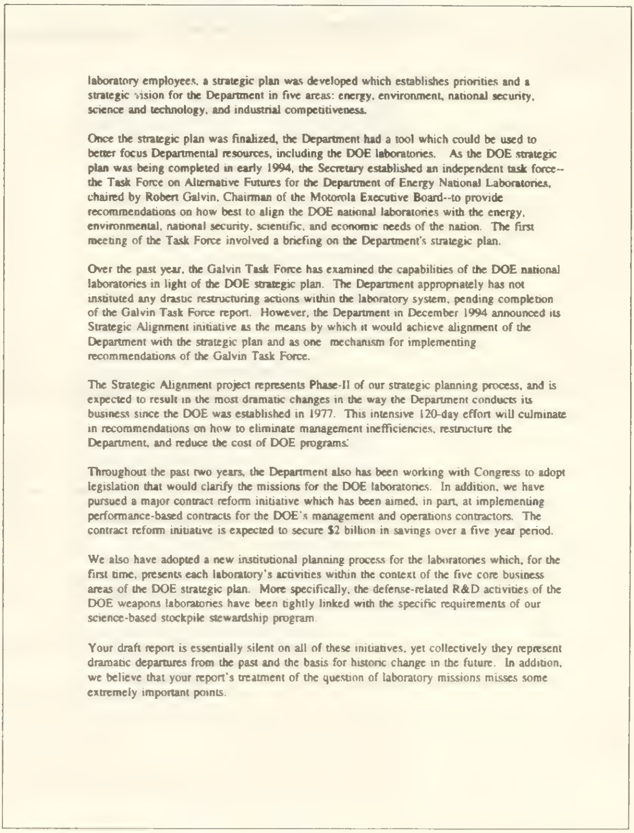
The primary finding of your report is that the Department of Energy has not delineated specific missions for its laboratories, and that a more precise allocation and integration of missions across the DOE laboratory system would enhance the contributions of these institutions. Your report correctly observes that previous reports on the DOE laboratories have contained similar conclusions, yet your draft fails to recognize the historic actions which the Department is undertaking to reduce costs, reform business practices, and redirect its resources--including the DOE laboratories--toward the major areas of national need within the DOE mission areas. These actions, described below, demonstrate the Clinton Administration's seriousness in reinventing government organizations and services.

One prior report on the DOE laboratories to which your draft refers, the July 1992 Secretary of Energy Advisory Board (SEAB) Report on the DOE National Laboratories, contained a fundamental truism:

> "A strategic vision of the future missions of the national laboratories cannot be developed until the Department and Nation have developed a similarly clear vision of their role in the future multipolar world."

The 1992 SEAB report recommended that the Department and the national laboratories do their part in addressing this problem by developing a strategic plan which would serve as a guide for decisions regarding the missions of both the Department and the laboratories.

During her first few months in office, Secretary O'Leary and senior departmental officials responded to this recommendation by initiating the development of a strategic plan for the Department. Through a lengthy and unprecedented process involving hundreds of DOE and



laboratory employees, a strategic plan was developed which establishes priorities and a strategic vision for the Department in five areas: energy, environment, national security, science and technology, and industrial competitiveness.

Once the strategic plan was finalized, the Department had a tool which could be used to better focus Departmental resources, including the DOE laboratories. As the DOE strategic plan was being completed in early 1994, the Secretary established an independent task force--the Task Force on Alternative Futures for the Department of Energy National Laboratories, chaired by Robert Galvin, Chairman of the Motorola Executive Board--to provide recommendations on how best to align the DOE national laboratories with the energy, environmental, national security, scientific, and economic needs of the nation. The first meeting of the Task Force involved a briefing on the Department's strategic plan.

Over the past year, the Galvin Task Force has examined the capabilities of the DOE national laboratories in light of the DOE strategic plan. The Department appropriately has not instituted any drastic restructuring actions within the laboratory system, pending completion of the Galvin Task Force report. However, the Department in December 1994 announced its Strategic Alignment initiative as the means by which it would achieve alignment of the Department with the strategic plan and as one mechanism for implementing recommendations of the Galvin Task Force.

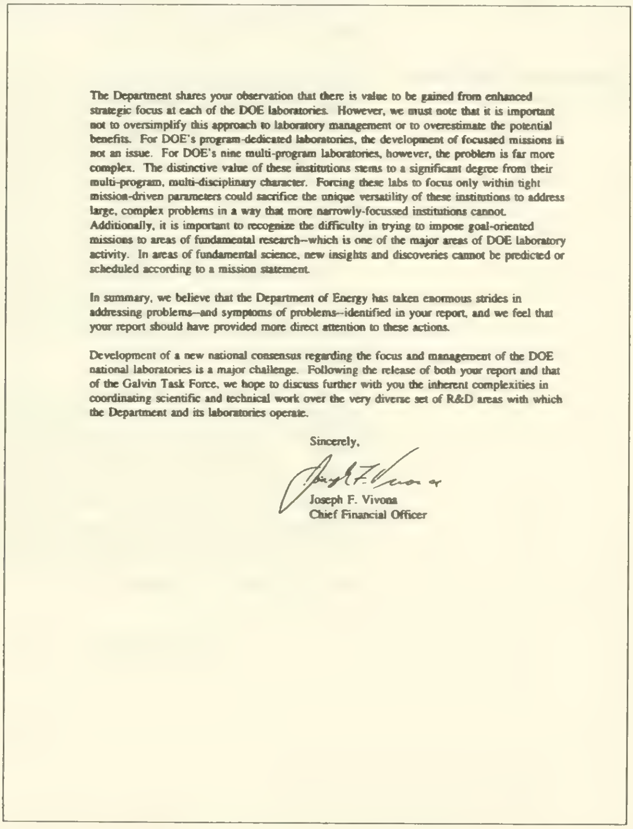
The Strategic Alignment project represents Phase-II of our strategic planning process, and is expected to result in the most dramatic changes in the way the Department conducts its business since the DOE was established in 1977. This intensive 120-day effort will culminate in recommendations on how to eliminate management inefficiencies, restructure the Department, and reduce the cost of DOE programs.

Throughout the past two years, the Department also has been working with Congress to adopt legislation that would clarify the missions for the DOE laboratories. In addition, we have pursued a major contract reform initiative which has been aimed, in part, at implementing performance-based contracts for the DOE's management and operations contractors. The contract reform initiative is expected to secure $2 billion in savings over a five year period.

We also have adopted a new institutional planning process for the laboratories which, for the first time, presents each laboratory's activities within the context of the five core business areas of the DOE strategic plan. More specifically, the defense-related R&D activities of the DOE weapons laboratories have been tightly linked with the specific requirements of our science-based stockpile stewardship program.

See comment 2.

Your draft report is essentially silent on all of these initiatives, yet collectively they represent dramatic departures from the past and the basis for historic change in the future. In addition, we believe that your report's treatment of the question of laboratory missions misses some extremely important points.



The Department shares your observation that there is value to be gained from enhanced strategic focus at each of the DOE laboratories. However, we must note that it is important not to oversimplify this approach to laboratory management or to overestimate the potential benefits. For DOE's program-dedicated laboratories, the development of focussed missions is not an issue. For DOE's nine multi-program laboratories, however, the problem is far more complex. The distinctive value of these institutions stems to a significant degree from their multi-program, multi-disciplinary character. Forcing these labs to focus only within tight mission-driven parameters could sacrifice the unique versatility of these institutions to address large, complex problems in a way that more narrowly-focussed institutions cannot. Additionally, it is important to recognize the difficulty in trying to impose goal-oriented missions to areas of fundamental research--which is one of the major areas of DOE laboratory activity. In areas of fundamental science, new insights and discoveries cannot be predicted or scheduled according to a mission statement.

In summary, we believe that the Department of Energy has taken enormous strides in addressing problems--and symptoms of problems--identified in your report, and we feel that your report should have provided more direct attention to these actions.

Development of a new national consensus regarding the focus and management of the DOE national laboratories is a major challenge. Following the release of both your report and that of the Galvin Task Force, we hope to discuss further with you the inherent complexities in coordinating scientific and technical work over the very diverse set of R&D areas with which the Department and its laboratories operate.

Sincerely,

Joseph F. Vivona
Chief Financial Officer

The following are GAO's comments on the Department of Energy's letter dated January 24, 1995.

GAO's Comments

1. While we discussed most of these initiatives in the draft report, we updated the final report to reflect DOE's progress in these areas. We generally agree that DOE's initiatives, especially those in strategic planning and contract reform, will strengthen the Department's capacity to manage. We also agree that the initiatives have potential for helping DOE refocus the missions and improve the management of its laboratories. However, these initiatives have not yet been implemented. Furthermore, many of the contract reforms will take years to be fully implemented. Thus, the outcome of the initiatives, while promising, is very uncertain. We also caution that DOE has had planning systems in the past, has reorganized many times, and has tried to institute reforms in prior years—all without significant success. Additionally, as we discussed extensively in the report, prior advisory groups recommended that DOE refocus its laboratory missions and improve its management of them, yet DOE failed to take significant action.

2. We agree that one of the strengths of the multiprogram laboratories is their ability, as discussed in our report, to combine their multidisciplinary talents toward tackling large, complex problems. Our discussion of the need for more clarity in mission focus aims to facilitate, not hinder, more laboratory interactions in complex activities. We are not suggesting "forcing" the laboratories into "tight mission-driven parameters." Rather, we urge that DOE improve and expand its ability to integrate mission-focused research and development within and among its laboratories. The need for more mission clarity and focus reflected a widespread consensus among laboratory and DOE managers, as well as experts with whom we consulted.

Appendix IV

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